CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/4 | All |
| **Examination** | **Date** | **Pages** |
| Final | April 2009 | 3 |
| **Instructors** | | **Course Examiner** |
| P. Eslami, R. Mearns, M. Padamadin, B. Rhodes | | E. Cohen |

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\frac{(1+i)^n - 1}{i}, \quad PV = PMT\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- ▷ Answer all questions and justify your answers.
- ▷ Only approved calculators are permitted.

*MARKS*

[10] 1. A company buys a new boat for \$224,000; the boat value will be \$115,200 after 16 years.

(a) Find a linear equation for the depreciated value $V$ of the boat $t$ years after it was purchased.

(b) What is the depreciated value of the boat after 10 years?

(c) When will the depreciated value fall below \$100,000?

[10] 2. Solve for $x$ in the following equations:

(a) $13^{7x} = 13^{2x^2+3}$

(b) $9^{2x-x^2} = 3^{-48}$

(c) $\log_b x = 3\log_b 2 + \frac{1}{2}\log_b 25 - \log_b 20$

(d) $\log_b x - \log_b(x-4) = \log_b 21$

(e) $\log_{10}(x-1) - \log_{10}(x+1) = 1$

[10] 3. (a) Find $f(1) + \ldots f(225)$ if $f(x) = 2x - 1$.

(b) Find $g(1) + \cdots + g(121)$ if $g(x) = \left(\frac{1}{2}\right)^x$.

[10] 4. A company establishes a sinking fund to buy new computer equipment, with monthly payments of \$1,500, into an account paying 6% compounded monthly.

(a) How long will it be before the account has \$50,000? (Round up to the next higher month if not exact.)

(b) How much interest has been earned?

[10] 5. A family has an \$80,000, 25-year mortgage at 8.4% compounded monthly.

(a) Find the monthly payment.

(b) Find the unpaid balance after 10 years.

(c) Find the unpaid balance after 20 years.

[10] 6. Solve by using Gauss-Jordan elimination only (no other method of solving this system will be accepted).

$$\begin{aligned} 4x_1 - 2x_2 + 3x_3 &= 3 \\ 3x_1 - x_2 - 2x_3 &= -10 \\ 2x_1 + 4x_2 - x_3 &= 1 \end{aligned}$$

[10] 7. An economy is based on 3 sectors: agriculture, manufacturing and energy. Production of a dollar's worth of agriculture requires inputs of \$0.20 from agriculture, \$0.20 from manufacturing and \$0.20 from energy. Production of a dollar's worth of manufacturing requires inputs of \$0.40 from agriculture, \$0.10 from manufacturing and \$0.10 from energy. Production of a dollar's worth of energy requires inputs of \$0.30 from agriculture, \$0.10 from manufacturing and \$0.10 from energy. Find the output from each sector that is needed to satisfy a final demand of \$10 billion from agriculture, \$15 billion from manufacturing and \$20 billion from energy.

[10] 8. Minimize and maximize $P = 20x + 10y$, subject to

$$\begin{aligned} 2x + 3y &\geq 30 \\ 2x + y &\leq 26 \\ -2x + 5y &\leq 34 \\ x, y &\geq 0 \end{aligned}$$

[10] 9. 6 female and 5 male applicants have been successfully screened for 5 positions. In how many ways can the following compositions be selected:

(a) 3 females and 2 males;

(b) 4 females and 1 male;

(c) 5 females;

(d) 5 people;

(e) at least 4 females.

[10] **10.** A shipment of 60 watches, including 9 that are defective, is sent to a store. The receiving department selects 10 at random for testing and rejects the whole shipment if 1 or more in the sample are found to be defective. What is the probability that the shipment will be rejected?

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/2 | All |
| **Examination** | **Date** | **Pages** |
| Final | December 2008 | 3 |
| **Instructors** | | **Course Examiner** |
| E. Cohen, E. Duma, T. Howlader, T. Hughes, B. Rhodes, C. Santana, U. Tiwari, M. Tziritas, H. Yue | | E. Cohen |

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\,\frac{(1+i)^n - 1}{i}, \quad PV = PMT\,\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- ▷ Answer all questions.
- ▷ **Only approved calculators are allowed.**

*MARKS*

[10] **1.** A plant can manufacture 50 rackets per day for a total daily cost of \$3855 and 60 rackets per day for a total daily cost of \$4245.

(a) Assuming that daily cost and production are linearly related, find the total daily cost $C(x)$ of producing $x$ rackets.

(b) Graph the total daily cost for $0 \leq x \leq 100$.

(c) Interpret the slope and $y$-intercept of this cost equation.

[10] **2.** Solve for $x$ in the following equations:

(a) $7^{x^2} = 7^{2x+3}$

(b) $4^{5x-x^2} = 2^{-12}$

(c) $\log_b x = \frac{3}{2}\log_b 4 - \frac{2}{3}\log_b 8 + 2\log_b 2$

(d) $\log_b(x+2) + \log_b x = \log_b 24$

(e) $\log_{10}(x+6) - \log_{10}(x-3) = 1$

[10] 3. (a) Find $f(1)+f(2)+...+f(175)$ if $f(x)=3-4x$

(b) Find $g(1)+g(2)+...+g(126)$ if $g(x)=\left(\frac{1}{3}\right)^x$

[10] 4. A company establishes a sinking fund for upgrading office equipment with monthly payments of \$2000 into an account paying 6.6% compounded monthly.

(a) How long will it be before the account has \$100000? (round up to the next higher month if not exact)

(b) How much interest has been earned?

[10] 5. A family has \$50000, 20-year mortgage at 7.2% compounded monthly.

(a) Find the monthly payment.

(b) Find the unpaid balance after 5 years.

(c) Find the unpaid balance after 15 years.

[10] 6. Solve by using Gauss-Jordan elimination only (no other method of solving this system will be accepted).

$$\begin{aligned} 5x_1 - 3x_2 + 2x_3 &= 13 \\ 2x_1 - x_2 - 3x_3 &= 1 \\ 4x_1 - 2x_2 + 4x_3 &= 12 \end{aligned}$$

[10] 7. A large company produces electricity, natural gas and oil. The production of a dollar's month of electricity requires inputs of \$0.30 for electricity, \$0.10 from natural gas, \$0.20 from oil. Production of a dollar's worth of natural gas requires inputs of \$0.30 electricity, \$0.10 from natural gas, to \$0.20 from oil. Production of a dollar's worth of oil requires inputs of \$0.10 from each sector. Find the output for each sector that is needed to satisfy a final demand of \$25 billion for electricity, \$15 billion for natural gas, and \$20 billion for oil.

[10] 8. Minimize and maximize $P=2x+y$ subject to

$$\begin{aligned} x+y &\geq 2 \\ 6x+4y &\leq 36 \\ 4x+2y &\leq 20 \\ x, y &\geq 0 \end{aligned}$$

[10] **9.** A jewellery store chain with 8 stores in Georgia, 12 in Florida, and 10 in Alabama is planning to close 10 of these stores.

(a) In how many ways can this be done?

(b) The company decides to close 2 stores in Georgia, 5 in Florida and 3 in Alabama. In how many ways can this be done?

[10] **10.** A manufacture produces 40 computer boards, including 7 that are defective. The quality control department selects 10 at random and will shut down the plant if 1 or more in the sample are found defective. What is the probability that the plant will be shut down?

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/1 | All |
| **Examination** | **Date** | **Pages** |
| Final | June 2008 | 3 |
| **Instructors** | | **Course Examiner** |
| A. Atoyan, J. Ruddy, U. Tiwari | | D. Sen |

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\,\frac{(1+i)^n - 1}{i}, \quad PV = PMT\,\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- ▷ Answer all questions.
- ▷ **Only approved calculators are allowed.**

*MARKS*

[10] **1.** The marketing research department for a company that manufactures and sells notebook computers established the following price-demand, revenue and cost functions:

$$p(x) = 2,000 - 60x$$
$$R(x) = x(2,000 - 60x)$$
$$C(x) = 4,000 + 500x$$

where $p(x)$ is the wholesale price in dollars at which $x$ thousand computers can be sold, and $C(x)$ and $R(x)$ are in thousands of dollars. Both functions have domain $1 \leq x \leq 25$.

(A) Find the output that will produce the maximum revenue. What is the maximum revenue to the nearest thousand dollars?

(B) What is the wholesale price per computer (to the nearest dollar) that produces the maximum revenue?

(C) For what outputs will a loss occur? Will a profit occur?

[10] **2.** Solve for $x$ in the following equations:

(A) $3^{3x-x^2} = \dfrac{1}{81}$

(B) $(81)^{2x} = (9)^{x^2-12}$

(C) $\log_b x = 3\log_b 2 + 0.5\log_b 25 - \log_b 20$

(D) $\log_3 x + \log_3(x-3) = \log_3 10$

(E) $\log_{10}(x+6) - \log_{10}(x-3) = 1$

[10] 3. For $f(x) = 18 - 3x$ and $g(x) = 4^{x-4}$ find the following:

(A) $\sum_{k=0}^{24} f(k) = f(0) + f(1) + f(2) + \cdots + f(24)$.

(B) $\sum_{h=0}^{19} g(h) = g(0) + g(1) + g(2) + \cdots + g(19)$.

[10] 4. A company estimates that it will have to replace a piece of equipment at a cost of \$800,000 in 5 years. To have this money available in 5 years, a sinking fund is established by making equal monthly payments into an account paying 6.6% compounded monthly.

(A) How much should each payment be?

(B) How much interest is earned during the last year?

[10] 5. A student receives a student loan for \$8,000 at 5.5% interest compounded monthly to help her finish the last 1.5% years of college. Starting 1 year after finishing college, the student must amortize the loan in the next 5 years by making equal monthly payments.

(A) What will the payments be?

(B) What total interest will the student pay?

[10] 6. Solve by using Gauss-Jordan Elimination:

$$3x_1 + x_2 - 2x_3 = 2$$

$$2x_1 - 4x_2 + 2x_3 = 6$$

$$2x_1 - x_2 - 3x_3 = 3$$

No other method of solving these systems of equations will be accepted!

[10] **7.** An economy is based on three sectors, agriculture, energy, and manufacturing. Production of a dollar's worth of agriculture requires an input of \$0.20 from the agriculture sector and \$0.40 from the energy sector. Production of a dollar's worth of energy requires an input of \$0.20 from the energy sector and \$0.40 from the manufacturing sector. Production of a dollar's worth of manufacturing requires an input of \$0.10 from the agriculture sector, \$0.10 from the energy sector, and \$0.30 from the manufacturing sector.

(A) Write the technological matrix $M$ for this economy.

(B) If a final demand of \$40 billion for agriculture, \$20 billion for energy, and \$60 billion for manufacturing is to be met, then set up the equation to be satisfied by the inputs from the respective sectors.

(C) Solve the respective inputs satisfying these demands.

[10] **8.** Extremize $P(x, y) = 30x + 10y$ subject to

$$2x + 2y \geq 4,\ 6x + 4y \leq 36,\ 2x + y \leq 10,\ x \geq 0,\ y \geq 0\,.$$

[10] **9.** A software development department consists of 6 women and 4 men.

(A) How many ways can they select a chief programmer, a backup programmer, and a programming librarian?

(B) How many ways can they select a team of 3 programmers to work on a particular project?

(C) If the positions in part(A) are selected by lottery, what is the probability that women are selected for all 3 positions?

[10] **10.** Ann and Barbara are playing a tennis match. The first player to win 2 sets wins the match. For any given set, the probability that Ann wins that set is $\frac{2}{3}$. Find the probability that

(A) Ann wins the match.

(B) 3 sets are played.

(C) The player who wins the first set goes on to win the match.

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/4 | All |
| **Examination** | **Date** | **Pages** |
| Final | April 2008 | 3 |

| **Instructors** | **Course Examiner** |
|---|---|
| B. Cais, D. Sen, E. Cohen, H. Greenspan, I. Anguelova, J. Lucier, K. Kelecenyi, M. Padamadan, R. Mearns, T. Hughes | D. Sen |

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\frac{(1+i)^n - 1}{i}, \quad PV = PMT\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- ▷ Answer all questions.
- ▷ **Only approved calculators are allowed.**

*MARKS*

[10] **1.** A charter fishing company buys a new boat for \$224,000 and assumes that it will have a trade in value of \$115,200 after 16 years.

(A) Find a linear equation for the depreciated value $V$ of the boat $t$ years after it was purchased.

(B) What is the depreciated value of the boat after 10 years?

(C) When will the depreciated value fall below \$100,000?

(D) Graph the equation $V$ for $0 \leq t \leq 20$.

[10] **2.** Solve for $x$ in the following equations:

(A) $4^{x-x^2} = \frac{1}{2}$

(B) $(25)^{2x} = (5)^{x^2-12}$

(C) $\log_{10} x = \frac{3}{2}\log_{10} 4 - \frac{2}{3}\log_{10} 8 + 2\log_{10} 2$

(D) $\log_a x + \log_a(x-2) = \log_a(x+4)$

(E) $\ln x + \ln(x-3) = \ln 10$

[10] 3. For $f(x) = 8x - 5$ and $g(x) = 3^{x-4}$ find the following:

(A) $\sum_{k=1}^{24} f(k) = f(1) + f(1) + f(2) + \cdots + f(24)$.

(B) $\sum_{h=1}^{20} g(h) = g(1) + g(1) + g(2) + \cdots + g(20)$.

[10] 4. A company estimates that it will have to replace a piece of equipment at a cost of \$800,000 in 5 years. To have this money available in 5 years, a sinking fund is established by making equal monthly payments into an account paying 6.6% compounded monthly.

(A) How much should each payments be?

(B) How much interest is earned during the last year?

[10] 5. A family has a \$50,000, 20-year mortgage at 7.2% compounded monthly.

(A) Find the monthly payment and the total interest paid.

(B) Suppose the family decides to add an extra \$100 to its mortgage payment each month starting with the very first payment. How long will it take the family to pay off the mortgage? How much interest will the family save?

[10] 6. Solve by using Gauss-Jordan Elimination:

$$5x_1 - 3x_2 + 2x_3 = 13$$

$$2x_1 - x_2 - 3x_3 = 1$$

$$4x_1 - 2x_2 + 4x_3 = 12$$

<u>No other method of solving these systems of equations will be accepted!</u>

[10] **7.** An economy is based on three sectors, coal, oil, and transportation. Production of a dollar's worth of coal requires an input of \$0.20 from the coal sector and \$0.40 from the transportation sector. Production of a dollar's worth of oil requires an input of \$0.10 from the oil sector and \$0.20 from the transportation sector. Production of a dollar's worth of transportation requires an input of \$0.40 from the coal sector, \$0.20 from the oil sector, and \$0.20 from the transportation sector.

(A) Write the technological matrix $M$ for this economy.

(B) If a final demand of \$30 billion for coal, \$10 billion for oil, and \$20 billion for transportation is to be met, then set up the equation to be satisfied by the inputs from the respective sectors.

(C) Solve the respective inputs satisfying these demands.

[10] **8.** Extremize $P(x, y) = 30x + 10y$ subject to

$$2x + 2y \geq 4,\ 6x + 4y \leq 36,\ 2x + y \leq 10,\ x \geq 0,\ y \geq 0.$$

[10] **9.** How many 4-person committees are possible from a group of 9 people if

(A) There are no restrictions?

(B) Both John and Barbara must be on the committee?

(C) Either John or Barbara (but not both) must be on the committee?

[10] **10.** Thirty animals are to be used in a medical experiment on diet deficiency: 3 male and 7 female rhesus monkeys, 6 male and 6 female chimpanzees, and 2 male and 8 female dogs. If one animal is selected at random, what is the probability of getting:

(A) A chimpanzee or a dog?

(B) A chimpanzee or a male?

(C) An animal other than a female monkey?

CONCORDIA UNIVERSITY
Department of Mathematics & Statis

Finite Mathematics for Business, Economics, Life Sciences and Social Sciences, 10th ed. by Barnett, Ziegler & Byleen

150

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/4 | All |
| **Examination** | **Date** | **Pages** |
| Final | April 2007 | 3 |
| **Instructors** | | **Course Examiner** |
| I. Anguelova, E. Duma, A. Iftekhar, K. Kelecsenyi, A. Keviczky, A. Kokotov, A. Marmora, C. Santana, D. Sen, U. Tiwari | | A. Keviczky |

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\frac{(1+i)^n - 1}{i}, \quad PV = PMT\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- ▷ Answer all questions.
- ▷ **Non-programmable calculators only** are permitted.

*MARKS*

[10] **1.** Let price $p$ in dollars be a linear function of the demand as well as supply $q$ (in hundreds) of T-shirts at a spring fair. The demands for 100 and 300 T-shirts yield prices of 4 and 8 dollars respectively. On the other hand, the supplies of 100 and 300 T-shirts yield prices of 10 and 8 dollars respectively.

(A) Find the price $p$ as a function of demand $q$ (in hundreds), which is the demand equation.

(B) Find the price $p$ as a function of supply $q$ (in hundreds), which is the supply equation.

(C) Find the equilibrium price and demand (supply).

(D) Graph these two price equations for $0 \le q \le 10$.

[10] **2.** Solve for the unknown $x$ in the following equations:

(A) $272^{12x+987} = 272^{132x-453}$.

(B) $(7\pi)^{3x^2-18x+152} = (7\pi)^{7x^2-6x-64}$.

(C) $\log \sqrt[3]{x} - 3\log 109 + \log \dfrac{(109)^3}{\sqrt{4}} = \log \dfrac{27}{2} + 9\log 1$.

(D) $\ln(x+3) - \ln(\frac{x}{20}+1) = 2\ln\sqrt{10}$.

(E) $\log_x 125 = 3$.

[10] 3. You are planning to buy a Lexus hybrid four-door sedan two and a half years from now and you will need a $30000 down payment. The present rate of annual interest is 7.5%.

(A) If the compounding is weekly, then what is your weekly payment?

(B) If the compounding is bi-monthly (twice a month), what are your bi-monthly payments?

(C) How much more of a return does the weekly compounding give over the bi-monthly compounding?

[10] 4. You buy a $2500000 "camping and trailer park" with a down payment of $500000, and you finance the remaining amount with a 10 year mortgage at 6.5% compounded weekly at your favourite bank.

(A) What are your weekly payments?

(B) What is your remaining balance after 7 years?

(C) If you add $1500 to each of your weekly payments, then how soon will you have paid off your debt?

(D) How much would you save by using method (C) rather than method (A)?

[10] 5. A grain company wants to lease a fleet of 20 covered hopper railcars with a combined capacity of 108000 $ft^3$. Hoppers with three different carrying capacities are available: 3000 $ft^3$, 4500 $ft^3$ and 6000 $ft^3$.

(A) How many of each type of hopper should they lease? (There are no fractional hoppers!)

(B) The monthly leasing rates are: $180, $225 and $325 for the 3000 $ft^3$, 4500 $ft^3$ and 6000 $ft^3$ hoppers respectively. Which solution in (A) minimizes the monthly leasing?

[10] 6. By means of Gauss-Jordan Row Reduction find the inverse $A^{-1}$ of the matrix

$$A = \begin{pmatrix} 4 & 5 & 6 \\ 1 & 1 & 1 \\ 4 & 5 & -4 \end{pmatrix}$$

No other method of calculating $A^{-1}$ will be accepted!

[10] 7. An economy is based on the three sectors of agriculture, energy and manufacturing. Production of one dollar's worth of agriculture requires an input of \$0.2 from agriculture and \$0.1 from energy. Production of one dollar's worth of energy requires an input of \$0.3 from energy and \$0.4 from manufacturing. Production of one dollar's worth of manufacturing requires an input of \$0.4 from agriculture, \$0.1 from energy and \$0.2 from manufacturing.

(A) Write the technological matrix $M$ for this economy.

(B) Write the matrix system that the output vector $X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$ must satisfy for a final demand of

$$D = \begin{pmatrix} 40 \\ 20 \\ 30 \end{pmatrix} \text{ (in billions of dollars),}$$

where $x_1, x_2$, and $x_3$ are the outputs from agriculture, energy and manufacturing respectively (in billions of dollars).

(C) Find this output vector $X$. (Hint: Use Gauss-Jordan Row Reduction!)

[10] 8. Extremize $Q(x, y) = 20x - 40y$ subject to

$$2x + 3y \geq 12,\ x + 2y \leq 30,\ 3x + y \leq 30,\ x \geq 0,\ y \geq 0.$$

[10] 9. A 4-person grievance committee is to be selected from departments A and B, consisting of 15 and 20 people respectively. In how many ways can the following committees be selected?

(A) 3 from department A and 1 from department B.

(B) 2 from department A and 2 from department B.

(C) All from department A.

(D) 4 regardless of department.

(E) At least 3 from department A.

[10] 10. A shipment of 80 wrist watches contains 6 that are defective. The receiving department selects 10 at random for testing, and rejects the whole shipment if one or more are defective.

(A) What is the probability that this shipment shall be accepted?

(B) What is the probability that this shipment shall be rejected?

Department of Mathematics & Statistics

**TEXTBOOK - MATH 208 (Dec 06)**
- *Finite Mathematics for Business, Economics, Life Sciences and Social Sciences*, 10th ed. by Barnett, Ziegler & Byleen

| Course | Number |
|---|---|
| Mathematics | 208/2 |

| Examination | Date | Pages |
|---|---|---|
| Final | December 2006 | 3 |

| Instructors | Course Examiner |
|---|---|
| I. Anguelova, M. Babich, E. Cohen, V. Enolskii, R. Gaba, A. Keviczky, R. Mearns, G. Pusztai, B. Rhodes, U. Tiwari, J. Zhou | A. Keviczky |

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\,\frac{(1+i)^n - 1}{i}, \quad PV = PMT\,\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- ▷ Answer all questions.
- ▷ **No programmable calculators allowed!**
  Non-programmable calculators are permitted.

*MARKS*

[10] **1.** Assume that supply $S$ and demand $D$ are linear functions of price $p$ (in dollars). At \$0.60 per bushel, the daily supply for wheat is 450 bushels, and the daily demand is 570 bushels. When the price $p$ is raised by \$0.75 per bushel, the daily supply increases to 600 bushels, and the daily demand decreases to 495 bushels.

(A) Find the supply $S = S(p)$ as a linear function of price $p$.

(B) Find the demand $D = D(p)$ as a linear function of price $p$.

(C) Find the equilibrium price $p$ – i.e., $S(p) = D(p)$ and the equilibrium demand (supply).

[10] **2.** Solve for $x$ in the following equations:

(A) $\pi^{12x-795+2x} = \pi^{-16x+105}$.

(B) $19x^2 - 24x - 95 = 7x^2 - 48x + 85$.

(C) $\log_7 x^2 + 4\log_7 3 - \log_7 9 = \log_7 243 - \log_7 \frac{1}{4} + \frac{1}{3}\log_7 1$.

(D) $e^{3x^2+3x} = e^{6x+60}$.

(E) $\ln(x+3) - \ln(x-4) = \ln 5$.

[10] **3.** Your garage shall need \$250000 five years from now for a new automobile diagnostic system, and the annual rate of interest at your favourite bank is 7.5%, which is compounded **weekly** (52 weeks in a year).

(A) What are your weekly payments such that you have \$250000 five years from now?

(B) What interest has your garage made?

(C) If you add \$1000 to the weekly payment, then how soon shall you have the \$250000?

[10] **4.** You are buying a \$300000 house, for which you make a downpayment of \$60000 and mortgage the rest for 25 years at 7.2% compounded **monthly**.

(A) What are your monthly payments?

(B) How much interest are you paying?

(C) What is the remaining balance after 15 years?

(D) How much are you saving by paying the remaining balance after 15 years?

[10] **5.** Given the functions $f(x) = 4x - 15$ and $g(x) = 5(1.2)^x$ find:

(A) $\sum_{i=1}^{20} f(i) = f(1) + f(2) + \cdots + f(20)$.

(B) $\sum_{i=0}^{10} g(i) = g(0) + g(1) + \cdots + g(10)$.

[10] **6.** Find the inverse $A^{-1}$ of the matrix $A = \begin{pmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{pmatrix}$

by means of Gauss-Jordan Row Reduction.
No other method of finding $A^{-1}$ shall be accepted!

[10] 7. An economy is based on agriculture, construction and energy. Production of a dollar's worth of agriculture requires an input of \$0.30, \$0.10 and \$0.20 from these respective sectors taken in the order: agriculture, construction and energy. Production of a dollar's worth of construction requires an input of \$0.20, \$0.10 and \$0.10 from these sectors taken in the above order. Whereas a dollar's worth of energy requires an input of \$0.20, \$0.10 and \$0.10 from each of these sectors taken in the same order.

(A) Write the technological matrix $M$ for the input-output analysis.

(B) Given the demand vector $D = \begin{pmatrix} d_1 \\ d_2 \\ d_3 \end{pmatrix}$,

write the equation for the output vector $X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$.

(C) Given that $D = \begin{pmatrix} 20 \\ 15 \\ 10 \end{pmatrix}$, find the corresponding output $X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$.

[10] 8. Extremize (find the extrema of) $z = -30x + 40y$ subject to

$$3x + 2y \leq 30,\ 5x + 4y \leq 40,\ x \leq 12,\ x \geq 0 \text{ and } y \geq 0.$$

[10] 9. Given a standard 52-card deck, find the probability of getting:

(A) 5 black cards in a 7-card hand.

(B) 7 number cards in a 7-card hand (number cards are 2, 3, 4, 5, 6, 7, 8, 9, 10).

(C) 4 face cards in a 7-card hand (face cards are jacks, queens and kings).

(D) 7 diamonds in a 7-card hand.

[10] 10. A shipment of 50 snow-blowers include 5 defective ones. The receiving department selects 7 at random, and rejects the entire shipment if one or more are defective.

(A) What is the probability that the shipment of snow-blowers shall be accepted?

(B) What is the probability that the shipment of snow-blowers shall be rejected?

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/2 | All |
| **Examination** | **Date** | **Pages** |
| Final | December 2007 | 3 |

**Instructors**

I. Anguelova, E. Cohen, E. Duma, V. Enolskii, R. Gaba, H. Greenspan, N. Jones, A. Keviczky, J. Lucier, C. Santana, U. Tiwari

**Course Examiner**

A. Keviczky

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\,\frac{(1+i)^n - 1}{i}, \quad PV = PMT\,\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- ▷ Answer all questions.
- ▷ **Only approved calculators are allowed.**

*MARKS*

[10] **1.** Given $y = -4x^2 + 12x - 12$,

(A) Find the $x$- and $y$- intercepts and the vertex.

(B) Use this information to graph $y = -4x^2 + 12x - 12$.

(C) Does the line $y = x - 1$ intersect $y = -4x^2 + 12x - 12$? Justify your answer!

[10] **2.** Solve for $x$ in the following equations:

(A) $e^{287x-721} = e^{152x-2071}$

(B) $(0.5)^{-3x^2+15x-72} = (0.5)^{-x^2+35x-22}$

(C) $\log_3\left(\frac{x}{5}\right) + \log_3 725 + 2\log_3\sqrt{5} = \frac{1}{3}\log_3\sqrt[3]{7} + 5\log_3 1$

(D) $\log_{11}(x+7) - \log_{11}(x+10) = \log_{11} 0.5$

(E) $\log_x 1000 = \frac{\ln 1000}{\ln 25}$

[10] 3. For $f(x) = -12x + 16$ and $q(x) = 3(0.8)^x$ find the following:

(A) $\sum_{k=0}^{17} f(k) = f(0) + f(1) + f(2) + \cdots + f(17)$.

(B) $\sum_{h=0}^{14} g(h) = g(0) + g(1) + g(2) + \cdots + g(14)$.

(C) What is $\sum_{h=0}^{\infty} g(h) = g(0) + g(1) + g(2) + \cdots + g(n) + g(n+1) + \ldots$?

[10] 4. You are planning to expand your hotel operation by buying a small island in the British Virgin Islands 3 years from now. For this you need a \$3,000,000 down payment. Your favourite bank offers you 7.2% interest compounded weekly for these 3 years.

(A) What are your weekly payments?

(B) How much interest are you earning?

(C) You decide that you only need a \$2,000,000 down payment, but add \$500 to each of the weekly payments obtained in (A). How soon will you have your \$2,000,000?

[10] 5. The island in the British Virgin Islands costs \$25,000,000 for which you make a \$3,000,000 down payment, and you mortgage the remaining amount. Your favourite bank offers you 6.6% interest compounded bi-monthly (twice each month) for 12 years.

(A) What are your bi-monthly payments?

(B) How much interest is the bank making?

(C) What is your remaining balance after 10 years?

(D) If you decide to pay off the remaining balance after 10 years, how much are you saving?

(E) If you pay off the remaining balance after 8 years, how much are you saving over paying off the remaining balance after 10 years (as in (D))?

[10] **6.** You need to transport 170,000 gallons of caustic chemicals by means of 25 railway tank-cars with carrying capacities of 5,000, 10,000 and 15,000 gallons respectively.

(A) Write the linear system of equations in terms of $x$, $y$ and $z$; $x$, $y$ and $z$ being the number of tank-cars with carrying capacities of 5,000, 10,000 and 15,000 gallons respectively.

(B) Solve this system of equations.

(C) If the rental of the 5,000, 10,000 and 15,000 gallon tank-cars costs \$400, \$700 and \$900 respectively, then which of the solutions yields the minimum cost?

[10] **7.** Find the inverse of the matrix

$$A = \begin{pmatrix} 2 & 3 & 2 \\ 3 & 1 & -2 \\ 1 & 4 & 3 \end{pmatrix}$$

by means of Gauss-Jordan Row Reduction. **No other method of calculating $A^{-1}$ will be accepted!**

[10] **8.** Extremize $P(x, y) = 20x - 15y$ subject to

$$x + 2y \geq 14,\ x + 3y \leq 42,\ 2x + y \leq 42,\ x \geq 0,\ y \geq 0\,.$$

[10] **9.** An island economy consists of the sectors of tourism, agriculture and fishing. To produce a dollar's worth of tourism requires an input of \$0.3, \$0.2 and \$0.1 from tourism, agriculture and fishing respectively. A dollar's worth of agriculture requires inputs of \$0.1 from each sector. On the other hand, a dollar's worth of fishing requires inputs of \$0.3, \$0.2 and \$0.1 from the sectors of tourism, agriculture and fishing.

(A) Write the technological matrix $M$ for this island economy.

(B) If a final demand of \$20 million, \$5 million and \$10 million from tourism, agriculture and fishing is to be met, then set up the equation to be satisfied by the inputs from the respective sectors.

(C) Solve the respective inputs satisfying these demands.

[10] **10.** A clothing store chain has 5, 8 and 12 stores in New Brunswick, Nova Scotia and Quebec respectively.

(A) The chain decides to close 10 of its stores. In how many ways can this be accomplished?

(B) If the chain decides to close 2, 4, and 4 stores in New Brunswick, Nova Scotia and Quebec respectively, in how many ways can this be done?

TEXTBOOK - MATH 208 (Apr 06)
Finite Mathematics for Business, Economics, Life Sciences and Social Sciences, 10th ed.
by Barnett, Ziegler & Byleen

Department of Mathematics & St

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/4 | All |
| **Examination** | **Date** | **Pages** |
| Final | April/May 2006 | 3 |

| Instructors | Course Examiner |
|---|---|
| L. Dube, P. Gauthier, A. Iftekhar<br>A. Keviczky, S. Mak, C. Santana, M. Trifkovic | A. Keviczky |

FORMULAE:

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\frac{(1+i)^n - 1}{i}, \quad PV = PMT\frac{1-(1+i)^{-n}}{i}$$

Special Instructions:

- Answer all questions.
- **No programmable calculators allowed!**
  Non-programmable calculators are permitted.

*MARKS*

[10] 1. Given the function $f(x) = \dfrac{-x^2+2x+9}{x-2}$ find:

(A) The domain of $f(x)$, namely the values $x$ for which $f(x)$ is defined.

(B) The asymptotes of $y = f(x)$.

(C) Use those asymptotes to graph $y = f(x)$.

[10] 2. Solve for $x$ in the following equations:

(A) $-2x^2 + 20x - 42 = 32x - 34$.

(B) $9^{-85x+11910} = 9^{11400}$.

(C) $\pi^{-21x^2+17} = \pi^{-25x^2+33}$.

(D) $\log x^3 - 2\log 4 + \frac{1}{2}\log 16 = \log x^2 + \frac{1}{3}\log 27 + \log 10$.

(E) $\log(x+5) - \log(2x-1) = 2\log\sqrt{3}$.

[10] 3. You need \$60000 as down-payment for your favourite BMW SUV five years from now. The current rate of annual interest at your favourite bank is 6%, and is compounded bi-monthly.

(A) What shall your bi-monthly payments be?

(B) If you decide to add \$500 to each bi-monthly payment, then how soon shall you have these \$60000?

(C) What are the interests you are getting for cases A) and B) respectively?

[10] 4. You are buying a \$2000000 (two million dollar) motel, which you finance over 10 years by weekly payments (there are 52 weeks in a year). If the going rate of annual interest is 6%, then

(A) What shall your weekly payments be?

(B) How much interest are you paying?

(C) What is the remaining balance after 5 years?

[10] 5. A chemical manufacturer wants to lease a fleet of 24 railroad tank cars with a combined carrying capacity of 520000 gallons. Tank cars are available with the capacities of 5000, 16000 and 24000 gallons. How many of each type of tank car should be leased? (Note: there is no such thing as renting a fraction of a railroad tank car!)

[10] 6. Given $f(x) = -2x + 12$ and $g(x) = (0.25)^x$, find

(A) $\sum_{i=0}^{20} f(i) = f(0) + f(1) + f(2) + \cdots + f(20)$.

(B) $\sum_{i=0}^{20} g(i) = g(0) + g(1) + g(2) + \cdots + g(20)$.

[10] 7. Find the inverse of the matrix $A = \begin{pmatrix} -2 & 6 & 6 \\ 2 & -4 & -4 \\ 2 & -10 & -8 \end{pmatrix}$

by means of Gauss-Jordan Row Reduction.
N.B. No other method of finding $A^{-1}$ shall be accepted!

[10] 8. An economy is based on the three industrial sectors of agriculture, building and energy. To produce a dollar's worth of agriculture requires an input of \$0.3, \$0.2 and \$0.1 from agriculture, building and energy respectively. The production of a dollar's worth of building requires inputs of \$0.1, \$0.1 and \$0.1 from the same sectors respectively. And finally, the production of a dollar's worth of energy requires inputs of \$0.3, \$0.2 and \$0.1 from the aforementioned sectors respectively. What input from each sector is required to satisfy a final demand of \$20 billion, \$5 billion and \$10 billion from the sectors of agriculture, building and energy respectively?

[10] 9. Find the extrema of $z = 400x + 100y$ subject to

$$2x + 2y \geq 4,\ 6x + 4y \leq 36,\ 2x + y \leq 10, x \geq 0 \text{ and } y \geq 0.$$

[10] 10. A jewelry store chain with 8 stores in Quebec, 12 in Ontario and 10 in Nova Scotia is planning to close 10 of the stores. Answer questions (A) and (B) with reference to this store chain.

(A) How many ways can this be accomplished?

(B) The chain decides to close 3 stores in Quebec, 5 in Ontario and 6 in Nova Scotia. How many ways can this be done?

A standard deck of 52 cards consists of 13 spades, 13 clubs, 13 diamonds and 13 hearts. Answer questions (C) and (D) with reference to these cards.

(C) What is the probability of getting only spades in a 7-card hand from a standard 52-card deck?

(D) What is the probability of getting at least one non-spade card in a 7-card hand from a standard 52-card deck?

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**TEXTBOOK - MATH 208 (Apr 05)**

- *Finite Mathematics for Business, Economics, Life Sciences and Social Sciences*, 10th ed. by Barnett, Ziegler & Byleen

Department of Mathematics & Statistics

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/4 | All |
| **Examination** | **Date** | **Pages** |
| Final | April/May 2005 | 3 |
| **Instructors** | | **Course Examiner** |
| J. Brody, B. Brown, R. Gaba, P. Gauthier, A. Ghitza<br>J. Ruddy, V. Shramchenko, R. Singh, O. Veres | | A. Keviczky |

FORMULAE:

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\frac{(1+i)^n - 1}{i}, \quad PV = PMT\frac{1-(1+i)^{-n}}{i}$$

Special Instructions:

- Answer all questions.
- Calculators are permitted.

*MARKS*

[10] **1.** The manufacturer of surfboards has fixed costs of \$500 per day and total costs of \$5500 per day at a daily output of 20 surfboards.

(A) Assuming the total cost $C(x)$ per day is linearly related to the total output $x$ per day, find the cost function.

(B) The average cost per surfboard for an output of $x$ boards is given by $\overline{C}(x) = \dfrac{C(x)}{x}$. Find the average cost function.

(C) Sketch a graph of the average cost function $\overline{C}(x)$ for $1 \leq x \leq 30$, including any asymptotes.

[10] **2.** Solve for $x$ in the following equations:

(A) $92.5x + 72 = 850$.

(B) $3x^2 - 3x = 36$.

(C) $7^{14x+7} = 7^{10x+127}$.

(D) $\log_{11} x - \frac{1}{2}\log_{11} 17 + 3\log_{11} 8 = 5\log_{11} 2 + \frac{1}{2}\log_{11} 17$.

(E) $\log_3(x+4) - \log_3(2x-1) = \log_3 5$.

[10] 3. Given $f(x) = 4x - 3$ and $g(x) = 9\,(\frac{1}{2})^x$, find:

(A) $\displaystyle\sum_{k=0}^{20} f(k) = f(0) + f(1) + f(2) + \cdots + f(20) = ?$

(B) $\displaystyle\sum_{k=0}^{20} g(k) = g(0) + g(1) + g(2) + \cdots + g(20) = ?$

[10] 4. You want to buy a \$30000 boat 5 years from now. The present annual interest rate is 6%.

(A) What should your monthly payments be into an account earning 6% interest compounded monthly?

(B) If you decide on monthly payments of \$650 into this account (earning 6% interest compounded monthly), then how long shall it take to have \$30000?

[10] 5. You buy a \$180000 yacht with a down-payment of \$30000 and finance the remaining amount for 25 years at a rate of 6% annual interest, which is compounded monthly.

(A) What are your monthly payments?

(B) What is the remaining balance after 15 years?

[10] 6. Find the inverse $A^{-1}$ of the matrix $A$ by means of **GAUSS-JORDAN** Elimination, where

$$A = \begin{pmatrix} 2 & -2 & 1 \\ 3 & 1 & -3 \\ 1 & -3 & 2 \end{pmatrix}.$$

No other method of finding $A^{-1}$ shall be accepted.

*CONTINUED ON NEXT PAGE*

[10] 7. An economy is based on transportation and manufacturing. Production of a dollar's worth of transportation requires an input of \$0.10 from each sector. Production of a dollar's worth of manufacturing requires an input of \$0.40 from each sector. Find the output for each sector that is needed to satisfy a final demand of \$5 billion from transportation and \$20 billion from manufacturing.

[10] 8. Extremize the function $R(x, y) = -10x + 12y$ subject to:

$$x \geq 0,\ y \geq 0,\ 3x + 5y \leq 45,\ 3x + 5y \geq 15,\ 5x + 3y \geq 15.$$

[10] 9. Suppose that 7 thank-you notes are written and 7 envelopes are addressed. Accidentally, the notes are randomly inserted into the envelopes and mailed without checking the addresses. What is the probability that all the notes are inserted into the correct envelopes?

[10] 10. A shipment of 33 PC's is received by "Jane and Jack Electronics". Five (5) of these PC's are defective. Eight (8) PC's are selected at random and tested. If one of these is defective, then the entire shipment is rejected.

(A) What is the probability that the shipment shall be rejected?

(B) What is the probability that the shipment shall be accepted?

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TEXTBOOK - MATH 208 (Dec 04)
• Finite Mathematics for Business, Economics, Life Sciences and Social Sciences, 10th ed. by Barnett, Ziegler & Byleen

Concordia UNIVERSITY

Department of Mathematics & Statistics

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208 | All |
| **Examination** | **Date** | **Pages** |
| Final | December 2004 | 3 |
| **Instructors** | | **Course Examiner** |
| J. Brody, B. Brown, A. Keviczky, A. Kokotov, R. Mearns M. Mei, J. Ruddy, M. Trifkovic | | A. Keviczky |

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\frac{(1+i)^n - 1}{i}, \quad PV = PMT\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- Answer all questions.
- Calculators are permitted.

*MARKS*

[10] **1.** The management of a company that manufactures snow-boards has fixed costs of \$400 per day and total costs of \$6400 per day at a daily output of 30 snow-boards.

(A) Given that the daily cost $C(x)$ is linear in terms of the total output $x$ per day, write the equation for the cost function.

(B) What is the toal cost for an output of 17snow-boards per day?

(C) Graph the cost function for $0 \leq x \leq 30$.

[10] **2.** Solve for $x$ in the following equations:

(A) $-10\,(x-5)^2 + 360 = 0.$

(B) $14^{9x-12} = 14^{-6x+102}.$

(C) $\log_4 x + \log_4 220 - 2\log_4 5 + \log_4\left(\frac{1}{4}\right) = \log_4 88.$

(D) $ln(x-4) - ln(2x+4) = ln3.$

(E) $7^{12x^2+309x} = 7^{9x^2+315x+72}.$

[10] 3. (A) A loan of \$10000 was repaid at the end of 6 months. What amount was repaid if a 8% annual rate of interest was charged?

(B) How long will it take money to double if it is invested at 8% monthly?

[10] 4. You establish a sinking fund by monthly payments of \$4000 into an account paying 7.2% compounded monthly.

(A) How long will it be before the account has \$200000?

(B) What monthly payments are necessary to have \$200000 within 5 years?

[10] 5. A family has a \$120000 30-year mortgage at 6.6% compounded monthly.

(A) What is the monthly payment?

(B) Find the unpaid balance after 25 years.

[10] 6. Find the inverse of the matrix

$A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & -1 \\ 5 & 4 & 2 \end{pmatrix}$ by means of **Gauss-Jordan** elimination. No other calculation of $A^{-1}$ shall be accepted!

[10] 7. A large energy company produces electricity, natural gas and oil. The production of a dollar's worth of electricity requires inputs of \$0.30, \$0.10 and \$0.20 from electricity, natural gas and oil respectively. Production of a dollar's worth of natural gas requires inputs of \$0.30, \$0.10 and \$0.20 from electricity, natural gas and oil respectively. Production of a dollar's worth of oil requires inputs of \$0.10 from each sector. Let $x_1, x_2$ and $x_3$ be the outputs from the sectors electricity, natural gas and oil that satisfy a final demand of \$25 billion for electricity, \$15 billion for natural gas and \$20 billion for oil. For \$

$\overrightarrow{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$ *find*:

(A) The technological matrix $M$ associated with this system;

(B) Write the matrix equation that $\overrightarrow{x}$ has to satisfy for the final demand, but do not solve for $\overrightarrow{x}$.

[10] 8. Extremize $z = -12x - 20y$ subject to

$$x \geq 0,\ y \geq 0,\ x + y \geq 3,\ 6x + 4y \leq 24,\ 4x + 6y \leq 24.$$

[10] 9. What is the probability of having

(A) 5 red cards in a 7-card hand from a standard deck of 52 cards?

(B) 5 face cards in an 8-card hand from a standard deck of 52 cards?

[10] **10.** A shipment of 20 "snow-blowers " include 4 defective ones. The receiving department selects 6 of these at random, and rejects the entire shipment if one or more are defective.

(A) What is the probability that the shipment of "snow-blowers" is rejected?

(B) What is the probability that this shipment shall be accepted?

TEXTBOOK - MATH 208 (APR 04)
Finite Mathematics for Business, Economics, Life Sciences and Social Sciences, 9th ed.
by Barnett, Ziegler, & Byleen

Concordia UNIVERSITY

Department of Mathematics & Statistics

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/4 | All |
| **Examination** | **Date** | **Pages** |
| Final | April/May 2004 | 3 |
| **Instructors** | | **Course Examiner** |
| M. Babinski, B. Brown, V. Chramtchenko, L. Dube, A. Ghitza, M.S. Islam, A. Khalil, M. Padamadan, U. Tiwari, H. Xu | | A. Keviczky |

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\frac{(1+i)^n - 1}{i}, \quad PV = PMT\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- Answer all questions.
- Calculators are permitted.

*MARKS*

[10] **1.** Office equipment was purchased for \$20000 and is assumed to have scrap value of \$2000 after 10 years. If its value depreciates linearly, then find:

(A) The linear equation that relates value $V(t)$ in dollars to time $t$ in years.

(B) What would the value of the equipment be after 6 years?

(C) Graph the equation $V = V(t)$ for $0 \leq t \leq 10$.

(D) Write a brief interpretation of the slope of the line found in part (A).

[10] **2.** Solve for $x$ in the following equations:

(A) $3x^2 + 6x - 24 = 0$

(B) $3^{9x-17} = 3^{-12x+44}$

(C) $\ln(15x) - 3\ln(2) + 2\ln(8) = \ln(3000)$

(D) $\log_7(15x+7) - \log_7(5x+8) = \log_7(2)$

(E) $7^{6x^2-25x+92} = 7^{5x^2-20x+88}$

[10] **3.** Given $f(x) = 12x - 3x$ and $g(x) = 9\,(\frac{1}{4})^x$, find:

(A) $\displaystyle\sum_{i=0}^{15} f(i) = f(0) + f(1) + f(2) + \cdots + f(15) = ?$

(B) $\displaystyle\sum_{i=0}^{15} g(i) = g(0) + g(1) + g(2) + \cdots + g(15) = ?$

[10] **4.** You can afford a monthly deposit of \$300 into an account that pays 4.7% compounded monthly.

(A) How long shall it take to have \$10000 for a boat?

(B) If you want your boat in 6 years, then how much should you deposit monthly (given the same rate of interest)?

[10] **5.** Your neighbour tells you that they made a \$35000 deposit on a new house and are to pay \$625 per month for 30 years.

(A) If interest is 7.8% compounded monthly, what was the selling price of the house?

(B) If they would have paid \$200 more per month, then how much sooner could they have paid the mortgage?

[10] **6.** Find the inverse $A^{-1}$ of matrix $A = \begin{pmatrix} -1 & -1 & 4 \\ 3 & 3 & -22 \\ -2 & -1 & 19 \end{pmatrix}$

by means of **GAUSS-JORDAN** elimination. No other calculation of $A^{-1}$ shall be accepted!

*CONTINUED ON NEXT PAGE*

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**TEXTBOOK - MATH 208 (DEC 03)**

- *Finite Mathematics for Business, Economics, Life Sciences and Social Sciences*, 9th ed. by Barnett and Ziegler

# CONCORDIA UNIVERSITY

**Course:** MATH **Number:** 208/2 **Sections:** All

**Examination:** Final **Date:** December 2003 **Time:** 3hours **#of pages:** 3

**Instr.:** Brody, Brown, Cummins, Dube, Khalil, Ruddy, Podder, Thaine

**Course Examiner:** J. Brody

**Special instructions:** Answer all questions. Calculators are permitted
Each problem is worth 10 marks.

**FORMULAE:**

$$A = P(1+i)^n,\ A = Pe^{rt},\ FV = PMT\frac{(1+i)^n-1}{i},\ PV = PMT\frac{1-(1+i)^{-n}}{i}$$

1. Solve exactly the following equations:
   (a) $3 - 5x = 10e$
   (b) $2^{3x+1} = (.5)^{1-x}$
   (c) $\ln(5-x) - 2\ln(1-x) = \ln 3$
2. Let $f(x) = 4x^2 - 4x + 1$
   (a) Use the standard form to determine the range of $f$.
   (b) Calculate the $x-intercept$ and $y-intercept$ of the graph $y = f(x)$.
   (c) Sketch the graph of $y = f(x)$.
3. John has \$12,000 to invest at an account with an annual interest $p\%$. In cases (a),(b) & (c), write the formula for the future value in 10 years if he invested it all
   (a) in an account with continuous compounding;
   (b) in an account with monthly compounding;
   (c) in equal monthly payments in an account with monthly compounding.
   (d) Which future value is the largest, and which one is the smallest
4. Let $f(x) = x - 5$ and $g(x) = \frac{5}{3^x}$.
   (a) What type of progression is $\{g(1), g(2), ...\}$ and give the exact values of $g(1), g(2)$ & $g(20)$.
   (b) What type of progression is $\{f(1), f(2), ...\}$ and give the exact values of $f(1), f(2)$ & $f(20)$.
   (c) Give the exact value of: $g(1) + g(2) + g(3) + ... + g(20)$.
   (d) Give the exact value of: $f(1) + f(2) + f(3) + ... + f(20)$.

5. Mr. Smith purchased a house for \$500,000. The house was financed by paying 20% down and signing a 25 year mortgage at 6% compounded monthly on the unpaid balance. Equal monthly payments were made to amortize the loan.

   (a) Determine (to the nearest cent) of these monthly payments.

   (b) How much was the last payment?

   (c) How much was the balance after 20 years?

6. Let $\mathbb{A} = \begin{bmatrix} 1 & 0 & -1 \\ -1 & 2 & 1 \\ 1 & -1 & 1 \end{bmatrix}$.

   (a) Use the Gauss-Jordan elimination to calculate $\mathbb{A}^{-1}$

   (b) Use $\mathbb{A}$ to solve the system: $\mathbb{A}^{-1} \begin{bmatrix} u \\ v \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ 7 \\ 2 \end{bmatrix}$.

7. An economy is based on food (F) and transportation (T). Production of a dollars worth of (F) requires \$0.40 from (F) and \$0.10 from (T). A dollar worth of (T) requires \$0.30 from (F) and \$0.20 from (T).

   (a) Calculate the output (to the closest dollar) for each sector that is required to satisfy a final demand of \$20 million for food and \$30 million for transportation.

   (b) Calculate the final demand if the food demand is decreased by \$10 million and the transportation output remains the same.

8. Let $z = x+5y$, subject to: $x+2y \geq 16, x+y \geq 12, 0 \leq x \leq 15, 0 \leq y \leq 20$.

   (a) Draw the feasible region and determine the coordinates of each corner point.

   (b) Calculate both the maximum and the minimum value of $z$.

   (c) State the coordnates of the corner points which produce the maximum value of $z$, and which produce the minimum value of $z$.

9. You are given a standard 52-card deck with the understanding that number cards are $2, 3, ..., 10$.

   (a) How many five card hands will consist of all number cards?

   (b) How many four card hands have no number cards?

10. A card is drawn at random from a standard 52-card deck. Given are two events:

    $M$ = The drawn card is black,

    $N$ = The drawn card is an even number card.

    (a) Calculate the conditional probability $P(N|M)$.

    (b) Test $M$ and $N$ for independence.

# CONCORDIA UNIVERSITY

| | | |
|---|---|---|
| **Course:** MATH | **Number:** 208/4 | **Sections:** All |
| **Examination:** Final | **Date:** April 2003 **Time:** 3hours | **#of pages:** 3 |
| **Instructors:** | | **Course Examiners** |
| Brown, Cohen, Greenspan, | | Keviczky, Brody |
| Podder, Saikia, Sarker, Srivastava, Toropu | | |
| **Special instructions:** Answer all questions. Calculators are permitted | | |

**FORMULAE:**

$$A = P(1+i)^n,\ A = Pe^{rt},\ FV = PMT\frac{(1+i)^n-1}{i},\ PV = PMT\frac{1-(1+i)^{-n}}{i}$$

*MARKS*

[10] 1. The price-demand function is $p(x) = 100 - 2x$ where $1 \leq x \leq 30$ in million dollars for $x-$ million microchips.

(a) In Cartesian coordinates sketch the graph of the revenue function $R(x) = xp(x)$.

(b) Calculate the output $x$ which produces maximum revenue.

(c) What is the wholesale price $p(x)$ (to the nearest dollar) that produces maximum revenue?

[10] 2. Solve the following equations:

(a) $5x + 2 = 9x - 24$

(b) $5x^2 - 10x - 10 = 5x + 40$

(c) $e^{x^2-2x+4} = e^{3x+10}$

(d) $\log(x+1) - \log(10x-3) = 1$

(e) $\log(x+2) + \log(x+1) = \log 2 + \log(x+2)$.

[10] 3. Let $g(x) = 2^x$ and $h(x) = 5 - 3x$.

(a) Calculate:

i. $g(1), g(2), g(3)$.

ii. $g(1) + g(2) + ... + g(20)$ using the appropriate formula.

(b) Calculate:

i. $h(1), h(2), h(3)$.

ii. $h(1) + h(2) + ... + h(20)$ using the appropriate formula.

[10] 4. A person plans to deposit \$10,000 into an account for three years. Calculate the interest earned if the bank pays:

(a) 6% annually compounded monthly.

(b) 7% annually compounded quarterly.

(c) 5% annually compounded continuously.

[10] 5. You have a 25 year mortgage of \$200,000 on a house at 7% compounded monthly.

(a) What is your monthly payment (iff rounded to the nearest dollar), and what is your last payment?

(b) What is your unpaid balance after 10 years?

[10] 6. Let: $\mathbb{A} = \begin{bmatrix} 1 & -1 & 0 \\ 2 & -1 & 3 \\ 3 & 1 & 11 \end{bmatrix}$

(a) Use Gauss-Jordan Elimination to calculate $\mathbb{A}^{-1}$. Any other method is not acceptable.

(b) Use $\mathbb{A}$ to solve the system:

$$\mathbb{A}^{-1} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ -1 \\ 7 \end{bmatrix}.$$

[10] 7. An economy is based on the two sectors: agriculture and energy. Production of dollar's worth of agriculture requires \$0.20 from agriculture and \$0.10 from energy. Production of dollar's worth of energy requires \$0.25 from agriculture and \$0.15 from energy.

(a) Calculate the outputs from both sectors that is needed to satisfy a demand of \$15 billion for agriculture and \$20 billion for energy.

(b) Calculate the outputs from both sectors that is needed if the above demand for agriculture increases by \$5 billion and the other demand remains the same.

[10] 8. Let $P = 3x + 2y$ subject to: $x + 2y \leq 4$, $x - y \geq -1$, $x \geq 0$, $y \geq 0$.

(a) Draw the graph of the feasible region.

(b) From the graph determine both coordinates of the point $\mathbf{A}(x, y)$, where $P$ is maximized.

(c) From the graph determine both coordinates of the point $\mathbf{B}(x, y)$, where $P$ is minimized.

[10] 9. You have a standard 52– card deck.

(a) What is the probability of getting 3 number-cards (2, 3,..., 10) in a 10–card hand?

(b) What is the probability of getting at least one face-card (J, Q, K) in a 10–card hand?

[10] 10. In a lottery Jack chooses 6 numbers out of 46.

(a) What is the probability that Jack's 6 numbers match all of the 6 randomly chosen numbers by the lottery?

(b) What is the probability that Jack's 6 numbers match exactly 2 out of the 6 randomly chosen numbers by the lottery?

**TEXTBOOK - MATH 208 (Dec 05)**

- *Finite Mathematics for Business, Economics, Life Sciences and Social Sciences*, 10th ed. by Barnett, Ziegler & Byleen

Department of Mathema

| Course | Number | Section(s) |
|---|---|---|
| Mathematics | 208/2 | All |
| **Examination** | **Date** | **Pages** |
| Final | December 2005 | 3 |

**Instructors**

J. Chuai, H. Greenspan, A. Iovita, A. Keviczky, A. Khalil, R. Mearns, M. Mei, G. Pusztai, B. Rhodes, J. Ruddy, O. Veres

**Course Examiner**

A. Keviczky

**FORMULAE:**

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\,\frac{(1+i)^n - 1}{i}, \quad PV = PMT\,\frac{1-(1+i)^{-n}}{i}$$

**Special Instructions:**

- ▷ Answer all questions.
- ▷ Calculators are permitted.

*MARKS*

[10] **1.** Office equipment was purchased for \$40000 and is assumed to have a scrap value of \$4000 after 10 years. If the value depreciates linearly from \$40000 to \$4000, then find:

(A) The linear equation that relates value $V$ in dollars to time $t$ in years.

(B) The value of the equipment after 4 years.

(C) Graph the equation for $0 \le t \le 10$.

[10] **2.** Solve for $x$ in the following equations:

(A) $2x^2 + 29x = 5x + 56$.

(B) $(17)^{3x+37} = (17)^{-9x+85}$.

(C) $\log_3 x = \log_3 15 - 2\log_3 10 + 5\log_3 \sqrt{5} - \log_3 2$.

(D) $\log_{11}(40x + 120) - \log_{11}(x + 12) = \log_{11} 20$.

(E) $e^{-3x^2-15x+22} = e^{-4x^2-8x+10}$.

[10] **3.** Given $f(x) = 4x + 3$ and $g(x) = \left(\frac{7}{8}\right)^x$, find the following sums:

(A) $\sum_{k=1}^{15} f(k)$ (B) $\sum_{k=0}^{15} g(k)$

[10] **4.** A company establishes a sinking fund for upgrading office equipment with monthly payments of \$3000 into an account paying 7.2% compounded monthly.

(A) How long will it be before the account has \$150000?

(B) What should the monthly payments be, if the company wants \$150000 5 years from now?

[10] **5.** You buy a \$250000 home with a down-payment of \$50000 and mortgage the remainder for 30 years at the rate of 4.8% compounded monthly.

(A) What are your monthly payments?

(B) What is the remaining balance after 15 years?

[10] **6.** Find the inverse $A^{-1}$ of the matrix $A$ by means of GAUSS-JORDAN row reduction, where

$$A = \begin{pmatrix} 1 & -3 & 2 \\ 2 & -2 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

No other method of finding $A^{-1}$ is acceptable!

[10] **7.** An economy is based on the sectors of agriculture, building and energy. The production of a dollar's worth of agriculture requires an input of 0.3, 0.1 and 0.2 dollars from agriculture, building and energy respectively. The production of a dollar's worth of building requires an input of 0.2, 0.1 and 0.1 dollars from agriculture, building and energy respectively. The production of a dollar's worth of energy requires an input of 0.2, 0.1 and 0.1 dollars from agriculture, building and energy respectively.

*(Continued on next page.)*

(A) Find the technological matrix $M$ for this system.

(B) If a final demand of \$5 billion, \$10 billion and \$15 billion is required from agriculture, building and energy, then set up the system of equations for the output $x, y$ and $z$ (in billions of dollars) needed from agriculture, building and energy to satisfy these final demands. Write your system in matrix form, but do not solve!

[10] **8.** Maximize and minimize $z = 25x - 20y$ subject to

$$x \geq 0,\ y \geq 0,\ x + y \geq 3,\ 5x + 6y \leq 30 \text{ and } 6x + 5y \leq 30.$$

[10] **9.** A 5-person grievance committee must be selected from 35 employees, of which 15 belong to department A and 20 to department B.

(A) What is the probability that 3 employees are selected from department A and 2 from department B?

(B) What is the probability that 2 employees are selected from department A and 3 from department B?

[10] **10.** A shipment of 30 personal computers includes 5 defective ones. The receiving department selects 7 computers at random, and rejects the entire shipment if one or more are defective.

(A) What is the probability that the shipment of personal computers is rejected?

(B) What is the probability that this shipment is accepted?