

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	208/2	All except EC	
Examination	Date	Time	Pages
Final	December 2014	3 Hours	3
Instructors	Course Examiner		
A. Bellahnid, C. Santana, D. Barrera, F. Romanelli, H. Greenspan, I. Gorelyshev, L. Dube, L. Eunghyun, S. Zaman, 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. A firm producing poultry feed finds that the total cost $C(x)$ in dollars of producing and selling x units is given by

$$C(x) = 20x + 100.$$

Management plans to charge \$24 per unit for the feed.

- (A) How many units must be sold for the firm to break even?
 - (B) For what values of x will a loss occur? A profit?
 - (C) What is the profit if 100 units of feed are sold?
 - (D) How many units must be sold to produce a profit of \$900?
- [10] 2. Solve for x in the following equations:
- (A) $9^{-x+15} = 27^x$
 - (B) $(e)^{-3x^2+15x-72} = (e)^{-x^2+35x-22}$
 - (C) $\log_7 \left(\frac{x}{5} \right) + \log_7 625 + 2 \log_7 \sqrt{5} = 3 \log_7 \sqrt[3]{7} + 4 \log_7 5$
 - (D) $\log_5(x+6) + \log_5(x+2) = 1$
 - (E) $\log_3 \sqrt{(x-2)} = 2$

- [10] 3. For $f(x) = 180 - 30x$ and $g(x) = 5^{x-5}$ find the following by only using a proper formula:

(A)
$$\sum_{k=1}^{50} f(k) = f(1) + f(2) + f(3) + \cdots + f(50).$$

(B)
$$\sum_{h=0}^{29} g(h) = g(0) + g(1) + g(2) + \cdots + g(29).$$

- [10] 4. A man deposits \$2,000 in an IRA on his 21st birthday and on each subsequent birthday up to, and including, his 29th. The account earns 8% compounded annually.

(A) If he leaves the money in the account without making any more deposits, how much will he have on his 65th birthday, assuming the account continues to earn the same rate of interest?

(B) How much would be in the account on his 65th birthday if he had started the deposits on his 30th birthday and continued making deposits on each birthday until (and including) his 65th birthday?

- [10] 5. Consider a \$21,281.27 loan for 7 years at 8% interest compounded quarterly and a payment of \$1000 per quarter-year.

(A) Compute the unpaid balance after 5 years.

(B) How much interest is paid during the fifth year?

(C) How much principal is repaid in the first payment?

(D) What is the total amount of interest paid on the loan?

- [10] 6. A company that rents small moving trucks wants to purchase 16 trucks with a combined capacity of 19,200 cubic feet. Three different types of trucks are available: a cargo van with a capacity of 300 cubic feet, a 15-foot truck with a capacity of 900 cubic feet, and a 24-foot truck with a capacity of 1,500 cubic feet.

(A) Write the linear system of equations in terms of x , y and z ; x , y and z being the number of a cargo vans, 15-foot trucks, and 24-foot trucks respectively.

(B) Solve this system of equations.

(C) The rental company charges \$24.95 per day for a cargo van, \$39.95 per day for a 15-foot truck, and \$49.95 per day for a 24-foot truck. Which of the solutions would produce the lowest daily income from the truck rentals?

FRANCESCA

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	208/2	All except EC	
Examination	Date	Time	Pages
Final	December 2011	3 Hours	3
Instructors	Course Examiner		
B. Rhodes, C. Santana, D. Sen, E. Smith, F. Romanelli, H. Greenspan, J. McSweeney, R. Mearns, T. Hughes, T. Zaihra	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. Given the quadratic function $f(x) = 1.2 + 0.96x - 0.12x^2$
- (A) Find x and y intercepts algebraically.
 - (B) Find the vertex form of f .
 - (C) Find the vertex and the maximum or minimum.
 - (D) Find the range of f .

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

(A) $\left(\frac{3}{4}\right)^x = \frac{16}{9}$

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

(C) $\log_3\left(\frac{x}{5}\right) + \log_3 7 + 2\log_3 \sqrt{5} = 3\log_3 \sqrt[3]{175} + 5\log_3 1$

(D) $\log_a x + \log_a(x+1) = \log_a 6$

(E) $\log_2(\sqrt{2x^2}) - 1 = \frac{3}{2}$

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

$$(A) \sum_{k=0}^{49} f(k) = f(0) + f(1) + f(2) + \cdots + f(49).$$

$$(B) \sum_{h=0}^{24} g(h) = g(0) + g(1) + g(2) + \cdots + g(24).$$

[10] 4. Kelly sells some land in Quebec. She will be paid a lump sum of \$60,000 in 7 years. Until then, the buyer pays 8% simple interest quarterly.

(A) Find the amount of each quarterly interest payment. $I = 1200$

(B) The buyer sets up a sinking fund so that enough money will be present to pay off the \$60,000. The buyer wants to make semiannual payments into the sinking fund; the account pays 6% compounded semiannually. Find the amount of each payment into the fund. $PMT = 3511.58, 4128.51$

(C) What is the amount in the sinking fund after the first two deposits.

[10] 5. A person purchased a house 10 years ago for \$160,000. The house was financed by paying 20% down and signing a 30-year mortgage at 7.75% on the unpaid balance with payments made monthly.

(A) What is the unpaid balance after 120th payment?

(B) After the 120th payment, the owner wishes to refinance the house due to a need for additional cash. If the loan company agrees to a new 30-year mortgage of 80% of the new appraised value of the house, which is \$225,000, how much cash will the owner receive after repaying the balance of the original mortgage?

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

$$2x_1 + 6x_2 + 15x_3 = -12$$

$$4x_1 + 7x_2 + 13x_3 = -10$$

$$3x_1 + 6x_2 + 12x_3 = -9$$

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 \$20 billion for agriculture, \$10 billion for energy, and \$30 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
- $$2x + 2y \geq 4, \quad 6x + 4y \leq 36, \quad 2x + y \leq 10, \quad x \geq 0, \quad y \geq 0.$$
- [10] 9. A small town has two radio stations: an AM station and an FM station. A survey of 100 town residents produced the following results: In the last 30 days, 65 people have listened to the AM station, 45 have listened to the FM station, and 30 have listened to both stations. During this 30-day period,
- (A) How many people in the survey have listened to the AM station but not to the FM station?
- (B) How many people in the survey have listened to the FM station but not to the AM station?
- (C) How many people in the survey have not listened to either station?
- [10] 10. A study on body types gave the following results: 45% were short, 25% were short and overweight, and 24% were tall and not overweight. Find the probabilities that a person is the following:
- (A) Overweight
- (B) Short, but not overweight
- (C) Tall and overweight

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	208/1	All except EC	
Examination	Date	Time	Pages
Final	June 2011	3 Hours	3
Instructors	Course Examiner		
D. Dryanov, L. Dube, 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. Given the quadratic function $f(x) = 0.25x^2 - 1.5x - 7$

(A) Find x and y intercepts algebraically.

(B) Find the vertex form of f .

(C) Find the vertex and the maximum or minimum.

(D) Find the range of f .

$$0.25(x^2 - 6) - 7 = 0.25(x^2 - 6 + 9) - 7 + 2.25$$

$$0.25(x - 3)^2 - 4.75$$

Vertex = (3, 4.75)

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

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

(B) $(1.5)^{-3x^2+15x-72} = (1.5)^{-x^2+35x-22}$

(C) $\log_{10}(2x + 1) - 1 = \log_{10}(x - 2)$

(D) $\log_3\left(\frac{x}{5}\right) + \log_3 25 + 2\log_3 \sqrt{5} = 3\log_3 \sqrt[3]{25} + 5\log_3 1$

(E) $\log_5(2x - 3) = 2$

- [10] 3. For $f(x) = 62 - 6x$ and $g(x) = 3(0.5)^x$ find the followings using only proper formula:

$$(A) \sum_{k=0}^{49} f(k) = f(0) + f(1) + f(2) + \cdots + f(49).$$

$$(B) \sum_{h=1}^{30} g(h) = g(1) + g(2) + g(3) + \cdots + g(30).$$

- [10] 4. Jim invests \$2000 at the end of each of 8 years in an account that earns 10%, compounded annually. After the initial 8 years, no additional contributions are made, but the investment continues to earn 10%, compounded annually, for 36 more years (until Jim is age 65). How much does Jim have at age 65?

- [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:

$$3x_1 - 2x_2 + x_3 = -7$$

$$2x_1 + x_2 - 4x_3 = 0$$

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

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

- [10] 7. An island economy is based on three sectors, tourism, agriculture, and fishing. Production of a dollar's worth of tourism requires an input of \$0.30 from the tourism sector, \$0.10 from the agriculture sector, and \$0.20 from the fishing sector. Production of a dollar's worth of agriculture requires an input of \$0.30 from the tourism sector, \$0.10 from the agriculture sector, and \$0.20 from the fishing sector. Production of a dollars worth of fishing requires an input of \$0.10 from each sector.
- (A) Write the technological matrix M for this island economy.
- (B) If a final demand of \$25 million, \$15 million and \$20 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] 8. Extremize $P(x, y) = 40x + 120y$ subject to
- $$2x + y \geq 16, x + y \leq 12, x + 2y \geq 14, x \geq 0, y \geq 0.$$
- [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. An auto company A subcontracts the manufacturing of its onboard computers to two companies: 40% to company B and 60% to company C . Company B in turn subcontracts 70% of the orders it receives from company A to company D and the remaining 30% to company E , both subsidiaries of company B . When the onboard computers are completed by companies D , E , and C , they are shipped to company A to be used in various car models. It has been found that 1.5%, 1%, and 5% of the boards from D , E , and C , respectively, prove defective during the 3 year warranty period after a car is first sold.
- (A) What is the probability that a given onboard computer will be defective during the 3 year warranty period?
- (B) What is the probability that a given onboard computer came from company E or C ?

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

1.26

Course	Number	Section(s)	
Mathematics	208/4	All except EC	
Examination	Date	Time	Pages
Final	April 2011	3 Hours	3
Instructors	Course Examiner		
A. Madjid, C. Cummins, C. Santana, E. Smith, R. Mearns, T. Hughes, T. Koulis	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 functions 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 $R(x)$ and $C(x)$ are in thousands of dollars. The functions $R(x)$ and $C(x)$ have domain $1 \leq x \leq 25$.

- (A) What is the wholesale price per computer (to the nearest dollar) that produces the maximum revenue?
 - (B) Find the break-even points.
 - (C) For what values of x will a loss occur? A profit?
- [10] 2. Solve for x in the following equations:
- (A) $e^{12} = (e^4)^x e^{x^2}$
 - (B) $(27)^{2x} = (3)^{x^2-7}$
 - (C) $\log_b x = \frac{3}{2} \log_b 4 - \frac{2}{3} \log_b 8 + 2 \log_b 2$
 - (D) $\log_a x + \log_a(x-4) = \log_a(21)$
 - (E) $\log_8(x+6) = 1 - \log_8(x+4)$

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

$$(A) \sum_{k=1}^{60} f(k) = f(1) + f(2) + f(3) + \cdots + f(60).$$

$$(B) \sum_{h=0}^{30} g(h) = g(0) + g(1) + g(2) + \cdots + g(30).$$

[10] 4. Beginning in January, a person plans to deposit \$100 at the end of each month into an account earning 6% compounded monthly. Each year taxes must be paid on the interest earned during that year. Find the interest earned during each year for the first 3 years.

[10] 5. A family has a \$129,000, 20-year mortgage at 7.2% compounded monthly.

(A) Find the monthly payment and the total interest paid during the entire life of the mortgage.

(B) Suppose the family decides to add an extra \$102.41 to its mortgage payment each month starting with the very first payment. How long will it take the family to pay off the mortgage?

(C) How much interest will be saved after adding the extra \$102.41?

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

$$3x_1 + 8x_2 - x_3 = -18$$

$$2x_1 + x_2 + 5x_3 = 8$$

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

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

- [10] 7. An economy is based on three sectors, agriculture, manufacturing, and energy. Production of a dollar's worth of agriculture requires an input of \$0.20 from agriculture, \$0.20 from manufacturing, and \$0.20 from energy. Production of a dollar's worth of manufacturing requires an input of \$0.40 from agriculture, \$0.10 from manufacturing, and \$0.10 from energy. Production of a dollar's worth of energy requires an input of \$0.30 from agriculture, \$0.10 from manufacturing, and \$0.10 from energy.
- (A) Write the technological matrix M for this economy.
- (B) If a final demand of \$10 billion for agriculture, \$20 billion for manufacturing, and \$15 billion for energy 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 $P(x, y) = 60x + 20y$ subject to
- $$2x + 2y \geq 4, \quad 6x + 4y \leq 36, \quad 2x + y \leq 10, \quad x \geq 0, \quad y \geq 0.$$
- [10] 9. A county park system rates its 20 golf courses in increasing order of difficulty as bronze, silver, or gold. There are only two gold courses and twice as many bronze as silver courses.
- (A) If a golfer decides to play a round at a silver or gold course, how many selections are possible?
- (B) If a golfer decides to play one round per week for 3 weeks, first on a bronze course, then silver, then gold, how many combined selections are possible?
- [10] 10. If each of 5 people is asked to identify his or her favorite book from a list of 10 best-sellers, what is the probability that at least 2 of them identify the same book?

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CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	208/2	All except EC	
Examination	Date	Time	Pages
Final	December 2010	3 Hours	3
Instructors			Course Examiner
A. Kokotov, B. Rhodes, E. Duma, E. Smith, J. McSweeney, J. Ruddy, R. Perez-Buendia, T. Koulis, 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. Given the quadratic function $f(x) = -0.15x^2 - 0.90x + 3.3$

- (A) Find x and y intercepts algebraically.
- (B) Find the vertex form of f .
- (C) Find the vertex and the maximum or minimum.
- (D) Find the range of f .

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

- (A) $4^{x^2-4x} = \frac{1}{256}$
- (B) $(100)^{2x} = (10)^{x^2-12}$
- (C) $3 \log_2(x-1) + \log_2 4 = 5$
- (D) $\log_a x + \log_a(x-4) = \log_a(x+6)$
- (E) $\log_3(4x-7) = 2$

- [10] 3. For $f(x) = 24 - 6x$ and $g(x) = 5^{x-5}$ find the following:
- (A) $\sum_{k=0}^{49} f(k) = f(0) + f(1) + f(2) + \cdots + f(49)$.
- (B) $\sum_{h=0}^{29} g(h) = g(0) + g(1) + g(2) + \cdots + g(29)$.
- [10] 4. A man deposits \$2,000 in an IRA on his 21st birthday and on each subsequent birthday up to, and including, his 29th. The account earns 8% compounded annually.
- (A) If he leaves the money in the account without making any more deposits, how much will he have on his 65th birthday, assuming the account continues to earn the same rate of interest?
- (B) How much would be in the account on his 65th birthday if he had started the deposits on his 30th birthday and continued making deposits on each birthday until (and including) his 65th birthday?
- [10] 5. On December 31, 1990, a house was purchased with the buyer taking out a 30 year, \$112,475 mortgage at 9% interest, compounded monthly. The mortgage payments are made at the end of each month.
- (A) Calculate the amount of the monthly payment.
- (B) Calculate the unpaid balance of the loan on December 31, 2016.
- (C) How much of the principal will be paid off during the year 2016?
- (D) How much interest will be paid during the year 2016?
- [10] 6. A company that rents small moving trucks wants to purchase 25 trucks with a combined capacity of 28,000 cubic feet. Three different types of trucks are available: a 10-foot truck with a capacity of 350 cubic feet, a 14-foot truck with a capacity of 700 cubic feet, and a 24-foot truck with a capacity of 1,400 cubic feet.
- (A) Write the linear system of equations in terms of x , y and z ; x , y and z being the number of 10-foot trucks, 14-foot trucks, and 24-foot trucks respectively.
- (B) Solve this system of equations.
- (C) The rental company charges \$19.95 per day for a 10-foot truck, \$29.95 per day for a 14-foot truck, and \$39.95 per day for a 24-foot truck. Which of the solutions would produce the largest daily income from the truck rentals?

- [10] 7. An economy is based on three sectors, agriculture, manufacturing, and energy. Production of a dollar's worth of agriculture requires an input of \$0.20 from agriculture, \$0.20 from manufacturing, and \$0.20 from energy. Production of a dollar's worth of manufacturing requires an input of \$0.40 from agriculture, \$0.10 from manufacturing, and \$0.10 from energy. Production of a dollar's worth of energy requires an input of \$0.30 from agriculture, \$0.10 from manufacturing, and \$0.10 from energy.
- (A) Write the technological matrix M for this economy.
- (B) If a final demand of \$10 billion for agriculture, \$15 billion for manufacturing, and \$20 billion for energy 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 $P(x, y) = 40x + 20y$ subject to
- $$6x + 9y \geq 90, \quad 2x + y \leq 26, \quad -2x + 5y \leq 34, \quad x \geq 0, \quad y \geq 0.$$
- [10] 9. A software development department consists of 6 women and 4 men.
- (A) How many ways can the department select a chief programmer, a backup programmer, and a programming librarian?
- (B) How many of the selections in part (A) consist entirely of women?
- (C) How many ways can the department select a team of 3 programmers to work on a particular project?
- [10] 10. Six popular brands of cola are to be used in a blind taste study for consumer recognition.
- (A) If 3 distinct brands are chosen at random from the 6 and if a consumer is not allowed to repeat any answers, what is the probability that all 3 brands could be identified by just guessing?
- (B) If repeats are allowed in the 3 brands chosen at random from the 6 and if a consumer is allowed to repeat answers, what is the probability that all 3 brands are identified correctly by just guessing?

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	208/4	All	

Examination	Date	Time	Pages
Final	April 2010	3 Hours	3

Instructors	Course Examiner
B. Rhodes, L. Dube, P. Eslami, R. Gaba, T. Koulis	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. Given the quadratic function $f(x) = -0.12x^2 + 0.96x + 1.2$

- (A) Find x and y intercepts algebraically.
- (B) Find the vertex form of f .
- (C) Find the vertex and the maximum or minimum.
- (D) Find the range of f .

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

- (A) $e^{2x} = e^{x^2-3}$
- (B) $2^{3x} = \frac{1}{8}$
- (C) $\log_{10}(2x-5) - \log_{10}(x-3) = 1$
- (D) $\log_b(x+2) + \log_b(x) = \log_b 24$
- (E) $\log_3(9x) - \log_3(x-8) = 4$

- [10] 3. For $f(x) = -20x + 15$ and $g(x) = 3(1.8)^x$ find the following:

(A)
$$\sum_{k=0}^{29} f(k) = f(0) + f(1) + f(2) + \cdots + f(29).$$

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

- [10] 4. Earl and Larry each begin full-time jobs in January 2009 and plan to retire in January 2057 after working for 48 years. Assume that any money they deposit into IRAs earns 6% interest compounded annually.

(A) Suppose Earl opens a traditional IRA account immediately and deposits \$5000 into his account at the end of each year for twelve years. After that he makes no further deposits and just lets the money earn interest. How much money will Earl have in his account when he retires in January 2057?

(B) Suppose Larry waits 12 years before opening his traditional IRA and then deposits \$5000 into the account at the end of each year until he retires. How much money will Larry have in his account when he retires in January 2057?

(C) Who had the most money in his account upon retirement?

- [10] 5. A person wants to establish an annuity for retirement purposes. He wants to make quarterly deposits for 20 years so that he can then make quarterly withdrawals of \$5,000 for 10 years. The annuity earns 7.32% interest compounded quarterly.

(A) How much will have to be in the account at the time he retires?

(B) How much should be deposited each quarter for 20 years in order to accumulate the required amount?

(C) What is the total amount of interest earned during the 30 year period?

- [10] 6. A chemical manufacturer wants to lease a fleet of 24 railroad tank cars with a combined carrying capacity of 520,000 gallons. Tank cars with three different carrying capacities are available: 8,000 gallons, 16,000 gallons, and 24,000 gallons.

(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 8,000, 16,000 and 24,000 gallons respectively.

(B) Solve this system of equations.

(C) If the cost of leasing an 8,000 gallon tank car is \$450 per month, a 16,000 gallon tank car is \$650 per month, and a 24,000 gallon tank car is \$1,150 per month, then which of the solutions would minimize the monthly leasing cost?

- [10] 7. A large energy company produces electricity, natural gas, and oil. The production of a dollar's worth of electricity requires an input of \$0.30 from electricity, \$0.10 from natural gas, and \$0.20 from oil. Production of a dollar's worth of natural gas requires an input of \$0.30 from electricity, \$0.10 from natural gas, and \$0.20 from oil. Production of a dollar's worth of oil requires an input of \$0.10 from each sector.
- (A) Write the technology matrix M for this economy.
- (B) If a final demand of \$25 million for electricity, \$15 million for gas, and \$20 million for oil 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
- $$2x + y \leq 20, 10x + y \geq 36, 2x + 5y \geq 36, x \geq 0, y \geq 0.$$
- [10] 9. A basketball team has 5 distinct positions. Out of 8 players, how many starting teams are possible if
- (A) The distinct positions are not taken into consideration?
- (B) The distinct positions are taken into consideration?
- (C) The distinct positions are not taken into consideration, but either Mike or Ken (but not both) must start?
- [10] 10. From a survey involving 1,000 people in a certain city, it was found that 500 people had tried a certain brand of diet cola, 600 had tried a certain brand of regular cola, and 200 had tried both types of cola. If a resident of the city is selected at random, what is the probability that
- (A) The resident has not tried either cola?
- (B) The resident has tried the diet cola or has not tried the regular cola?
- (C) The resident has tried one of the colas but not both?

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	208/2	All	
Examination	Date	Time	Pages
Final	December 2009	3 Hours	3
Instructors	Course Examiner		
B. Rhodes, E. Cohen, E. Duma, F. Romanelli, H. Greenspan, L. Dube, M. Padamadan, P. Gauthier, R. Mearns, T. Hughes, V. Enolskii	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 memory chips for microcomputers established the following price-demand, revenue and cost functions:

$$p(x) = 75 - 3x$$

$$R(x) = x(75 - 3x)$$

$$C(x) = 125 + 16x$$

where $p(x)$ is the wholesale price in dollars at which x million chips can be sold, $R(x)$ and $C(x)$ are in millions of dollars. Both functions have domain $1 \leq x \leq 20$.

- (A) Find the output that will produce the maximum revenue. What is the maximum revenue?
- (B) Find the break-even points to the nearest thousands chips.
- (C) For what outputs will a loss occur?
- [10] 2. Solve for x in the following equations:
- (A) $2^{x^2-4x} = \frac{1}{16}$
- (B) $(10)^{3x^2+25x-72} = (10)^{x^2+35x-22}$
- (C) $\ln(x+2) = \ln(x-7) + \ln 4$
- (D) $\log_{10}(x-1) + \log_{10}(x+2) = 1$
- (E) $\log_3(6x-2) = 2$

- [10] 3. For $f(x) = 36 - 6x$ and $g(x) = 5(0.4)^x$ find the followings using only proper formula:

$$(A) \sum_{k=1}^{30} f(k) = f(1) + f(2) + f(3) \cdots + f(30).$$

$$(B) \sum_{h=1}^{20} g(h) = g(1) + g(2) + g(3) + \cdots + g(20).$$

- [10] 4. A business borrows \$80,000 at 9.42% interest compounded monthly for 8 years.

- (A) What is the monthly payment?
 (B) What is the unpaid balance at the end of the first year?
 (C) How much interest was paid during the first year?

- [10] 5. The Beyes plan to purchase a home for \$212,000. They will pay 20% down and finance the remainder for 30 years at 7.2% interest, compounded monthly.

- (A) How large are their monthly payments?
 (B) What will be their approximate loan balance right after they have made their 96th payment?
 (C) How much interest will they pay during the 7th year of the loan?
 (D) If they were to increase their monthly payments by \$150, how long would it take to pay off the loan?

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

$$3x_1 + 8x_2 - x_3 = -18$$

$$2x_1 + x_2 + 5x_3 = 8$$

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

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

- [10] 7. An island economy is based on three sectors, tourism, agriculture, and fishing. Production of a dollar's worth of tourism requires an input of \$0.20 from the tourism sector and \$0.40 from the fishing sector. Production of a dollar's worth of agriculture requires an input of \$0.10 from the agriculture sector and \$0.20 from the fishing sector. Production of a dollar's worth of fishing requires an input of \$0.40 from the tourism sector, \$0.20 from the agriculture sector, and \$0.20 from the fishing sector.
- (A) Write the technological matrix M for this island economy.
- (B) If a final demand of \$30 million, \$10 million and \$20 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] 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 survey of 1,000 people indicates that 340 have invested in stocks, 480 have invested in bonds, and 210 have invested in stocks and bonds.
- (A) How many people in the survey have invested in stocks or bonds?
- (B) How many people in the survey have invested in neither stocks nor bonds?
- (C) How many people in the survey have invested in bonds and not in stocks?
- [10] 10. To transfer into a particular technical department, a company requires an employee to pass a screening test. A maximum of 3 attempts are allowed at 6-month intervals between trials. From past record it is found that 40% pass on the first trial; of those that fail the first trial and take the test a second time; 60% pass; and of those that fail on the second trial and take the test a third time, 20% pass. For an employee wishing to transfer:
- (A) What is the probability of passing the test on the first or second try?
- (B) What is the probability of failing on all 3 attempts?
- (C) What is the probability of failing on the first 2 trials and passing on the third?

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 $f(1) + \dots + f(225)$ if $f(x) = 2x - 1$.
(b) Find $g(1) + \dots + g(121)$ 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).

$$4x_1 - 2x_2 + 3x_3 = 3$$

$$3x_1 - x_2 - 2x_3 = -10$$

$$2x_1 + 4x_2 - x_3 = 1$$

- [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.
- Assuming that daily cost and production are linearly related, find the total daily cost $C(x)$ of producing x rackets.
 - Graph the total daily cost for $0 \leq x \leq 100$.
 - Interpret the slope and y -intercept of this cost equation.
- [10] 2. Solve for x in the following equations:
- $7^{x^2} = 7^{2x+3}$
 - $4^{5x-x^2} = 2^{-12}$
 - $\log_b x = \frac{3}{2} \log_b 4 - \frac{2}{3} \log_b 8 + 2 \log_b 2$
 - $\log_b(x+2) + \log_b x = \log_b 24$
 - $\log_{10}(x+6) - \log_{10}(x-3) = 1$

- [10] 3. (a) Find $f(1) + f(2) + \dots + f(175)$ if $f(x) = 3 - 4x$
- (b) Find $g(1) + g(2) + \dots + g(126)$ 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 worth 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 and Statistics

Course
Math
Examination
Final
Instructor
Fred E Szabo

Number
208
Date
August 2008

Section
EC
Pages
3
EC Course Examiner
Fred E Szabo

Instructions

- All scientific and programmable calculators are allowed
- Ten 8.5×11 single-sided pages of handwritten notes are allowed
- No other material is allowed

Formulas

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

Evaluation

All questions are worth 10 marks. The examination counts for 50% towards your final grade. Numerical answers should be in exact form whenever possible.

Questions

Question 1

The marketing research department for a company that manufactures and sells notebook computers established the following price-demand and revenue functions:

$$p(x) = 2,000 - 60x$$

$$R(x) = x(2,000 - 60x)$$

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

- A Sketch a graph of the revenue function in a rectangular coordinate system.
- B Find the output that will produce the maximum revenue. What is the maximum revenue to the nearest thousand dollars?
- C What is the wholesale price per computer (to the nearest dollar) that produces the maximum revenue?

Question 2

Solve the following equations for x :

- A $16^{329x+191} = 16^{204x-2059}$
- B $(49)^{2x} = (7)^{x^2-12}$
- C $\frac{3}{2} \log_b 4 - \frac{2}{3} \log_b 8 + \log_b 2 = \log_b x$
- D $5 \log_5(3x+8) - 5 \log_5(2x-5) = 5$
- E $\log_{10}(x+6) - \log_{10}(x-3) = 1$

Question 3

For $f(x) = 2x - 3$ and $g(x) = 3^{x-3}$ find the following:

- A $\sum_{k=0}^{49} f(k) = f(0) + f(1) + f(2) + \dots + f(49)$.
- B $\sum_{h=0}^{19} g(h) = g(0) + g(1) + g(2) + \dots + g(19)$.

Question 4

In four years, you have decided to take a two day "Earth Orbital Tour", offered by NASA Enterprises Inc. This little adventure will cost you \$100,000. Your local loan shark offers you 7.2% interest compounded bi-monthly (twice each month).

- A The total amount of \$100,000 must be paid by departure date (four years). What are your bi-monthly payments?
- B How much interest have you earned?
- C If you could only afford bi-monthly payments of \$800, how long would it take you to acquire your Space vacation fund?

Question 5

While on a trip to Peru, you decided to buy an "Inca Sacrificial Altar", for \$160,000. You decide on a down-payment of \$40,000 and to finance the remaining balance over 25 years with monthly payments. The local native bank offers you 5.4% interest compounded monthly.

- A What are your monthly payments?
- B You decide, after 15 years of unfair monthly payments, to payoff the remaining balance. What is the remaining balance?
- C How much are you saving by paying off the remaining balance after 15 years?

Question 6

Solve by using Gauss-Jordan Elimination:

$$\begin{cases} 3x_1 + 6x_2 + 9x_3 = 3 \\ 2x_1 + 3x_2 + 4x_3 = 3 \\ 3x_1 + 6x_2 + 3x_3 = 9 \end{cases}$$

Remark No other method of solving these systems of equations will be accepted. You may use elementary matrices to express the row operations involved.

Question 7

An economy is based on three sectors, shipping, agriculture, and mining. Production of a dollar's worth of shipping requires an input of \$0.30 from the shipping sector, \$0.20 from the agriculture sector and \$0.40 from mining sector. Production of a dollar's worth of agriculture requires an input of \$0.30 from the shipping sector, \$0.20 from the agriculture sector and \$0.20 from mining sector. Production of a dollar's worth of mining requires an input of \$0.20 from the shipping sector, \$0.30 from the agriculture sector and \$0.30 from mining sector.

- Write the technological matrix M for this economy.
- If a final demand of \$180 million for shipping, \$200 million for agriculture, and \$300 million for mining is to be met, then set up the equation to be satisfied by the inputs from the respective sectors.
- Solve the respective inputs satisfying these demands.

Question 8

Find the extrema of the function $P(x, y) = 180x - 1202y$ subject to

$$x + y \leq 30, 3x + 5y \geq 15, 5x + 3y \geq 15, x \geq 0, y \geq 0.$$

Question 9

The 2003 Toyota Matrix was first made available with 2 different engines and with 3 levels of trim, plus either front-wheel or all-wheel drive.

- How many different Toyota Matrix cars (not counting color) were available for purchase?
- If you include color and there were 6 colors available, how many different Toyota Matrix cars were available for purchase?

Question 10

A shipment of 40 Mickey Mouse watches contains 6 defective ones. The shipping department selects seven of these watches and rejects the entire shipment if one or more are defective.

- What is the probability that the entire shipment shall be accepted?
- What is the probability that the entire shipment shall be rejected?

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. Kelecsenyi, 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:

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

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

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

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

- [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?