CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number		Section(s)
Mathematics	208/4		All except EC
Examination	**Date**	**Time**	**Pages**
Final	April 2015	3 Hours	3
Instructors			**Course Examiner**
A. Bellahnid, A. Sen, E. Duma, E. Lee, F. Babaee, S. Bettin			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.** At a price of \$2.28 per bushel, the supply of barley is 7,500 million bushels and the demand is 7,900 million bushels. At a price of \$2.37 per bushel, the supply of barley is 7,900 million bushels and the demand is 7,800 million bushels.

(A) Find a price-supply equation of the form $p = mx + b$.

(B) Find a price-demand equation of the form $p = mx + b$.

(C) Find the equilibrium point.

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

(A) $4^{x^2}(2^{5x}) = 8$

(B) $3^{x^2+x} = \sqrt{3}$

(C) $\log_2 \sqrt{2y^2} - 1 = \frac{3}{2}$

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

(E) $\log_2(\log_2 x) = 1$

[10] **3.** For $f(x) = -24x + 32$ and $g(x) = 6(0.4)^x$ find the following:

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

(B) $\sum_{h=1}^{19} g(h) = g(1) + g(2) + g(3) + \cdots + g(19)$.

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

[10] **4.** Joe Seniw bought a rare stamp for his collection. He agreed to pay a lump sum of \$4,000 after 5 years. Until then, he pays 6% simple interest semiannually.

(A) Find the amount of each semiannual interest payment.

(B) Seniw sets up a sinking fund so that enough money will be present to pay off the \$4,000. He wants to make annual payments into the fund. Starting now, the account pays 8% compounded annually. Find the amount of each payment.

[10] **5.** The Rechtien family buys a house for \$140,000 with a down payment of \$30,000. The family takes out a 30-year, \$110,000 mortgage at an annual interest rate of 6.6% compounded monthly.

(A) Find the amount of the monthly payment needed to amortize this loan.

(B) Find the total amount of interest paid when the loan is amortized over 30 years.

(C) Find the part of the first payment that is interest and the part that is applied to reducing the debt.

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

$$2x_1 - x_2 + x_3 = -9$$

$$4x_1 + 4x_2 - 4x_3 = 24$$

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

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

[10] **7.** An island economy consists of the sectors of tourism, agriculture and fishing. To produce a dollar's worth of tourism requires an input of \$0.2 from each sector. A dollar's worth of agriculture requires inputs of \$0.4, \$0.1 and \$0.1 from tourism, agriculture and fishing respectively. On the other hand, a dollar's worth of fishing requires inputs of \$0.3, \$0.1 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 \$10 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 $P(x, y) = 50x + 50y$ subject to

$$5x + 8y \geq 200,\ 25x - 10y \geq 250,\ 4x + 4y \leq 600,\ x \geq 0,\ y \geq 0.$$

[10] **9.** A package contains 100 fuses, of which 10 are defective. A sample of 5 fuses is selected at random.

(A) How many of the samples contain 2 defective fuses?

(B) How many of the samples contain at least 1 defective fuse?

[10] **10.** A large computer company A subcontracts the manufacturing of its circuit boards 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 boards are completed by companies D, E, and C, they are shipped to company A to be used in various computer models. It has been found that 1.5%, 1%, and 0.5%, of the boards from D, E, and C, respectively, prove defective during the 90-day warranty period after a computer is first sold.

(A) What is the probability that a given board in a computer will be defective during 90-day warranty period?

(B) What is the probability that a circuit board in a completed computer came from company E or C?

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Course	Number		Section(s)
Mathematics	208/4		All except EC
Examination	**Date**	**Time**	**Pages**
Final	April 2017	3 Hours	3
Instructors			**Course Examiner**
D. Sen, F. Romanelli, M. Padamadan, P. Gauthier, 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.** Suppose a company has fixed costs of \$28,000 and variable cost per unit of $\frac{2}{5}x + 222$ dollars, where x is the total number of units produced. Suppose further that the selling price of its product is $1250 - \frac{3}{5}x$ dollars per unit.

(A) Find the break-even points.

(B) Form the profit function from the cost and revenue functions and find the maximum profit.

(C) What price will maximize the profit?

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

(A) $(49)^{2x} = (7)^{x^2-12}$

(B) $3\log_2(x-1) + \log_2 4 = 5$

(C) $\ln\left(\frac{x}{5}\right) + \ln 625 + 2\ln\sqrt{5} = 3\ln\sqrt[3]{7} + 4\ln 5$

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

(E) $\frac{1}{4}\log_x 256 = 12$

[10] **3.** For $f(x) = 48x - 5$ and $g(x) = 5(2.4)^x$ find the following by only using a proper formula:

(A) $\sum_{k=0}^{69} f(k) = f(0) + f(1) + f(2) + \cdots + f(69)$.

(B) $\sum_{h=1}^{50} g(h) = g(1) + g(2) + g(3) + \cdots + g(50)$.

[10] **4.** Chuck Hickman bought a rare stamp for his collection. He agreed to pay a lump sum of \$4,000 after 4 years. Until then, he pays 6% simple interest semiannually.

(A) Find the amount of each semiannual interest payment.

(B) Chuck Hickman sets up a sinking fund so that enough money will be present to pay off the \$4,000. He wants to make annual payments into the fund. The account pays 8% compounded annually. Find the amount of each payment.

(C) Prepare a table showing the amount in the sinking fund after each deposit.

[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) How much interest will be paid during the month of January 2017?

(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.** The U-Drive Rent-a-Truck Company plans to spend 3 million dollars on 200 new vehicles. Each van will cost \$10,000, each small truck \$15,000, and each large truck \$25,000. Past experience shows that U-Drive needs twice as many vans as small trucks..

(A) Write the linear system of equations in terms of x, y and z; x, y and z being the number of vans, small trucks and large trucks respectively.

(B) How many of each kind of vehicle can the company buy?

[10] **7.** An economy is based on three sectors, shipping, agriculture, and mining. Production of a dollar's worth of shipping requires an input of \$0.50 from the shipping sector, \$0.20 from the agriculture sector and \$0.10 from mining sector. Production of a dollar's worth of agriculture requires an input of \$0.10 from the shipping sector, \$0.50 from the agriculture sector and \$0.30 from mining sector. Production of a dollar's worth of mining requires an input of \$0.10 from the shipping sector, \$0.30 from the agriculture sector and \$0.40 from mining sector.

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

(B) If a final demand of \$85 million for shipping, \$65 million for agriculture, and \$0 million for mining 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 $P(x, y) = 40x + 100y$ subject to

$$3x + 2y \leq 6,\ -4x + 8y \leq 16,\ 6x + 6y \geq 6,\ x \geq 0,\ y \geq 0.$$

[10] **9.** A child has a set of differently shaped plastic objects. There are 2 pyramids, 5 cubes, and 6 spheres.

(A) How many arrangements are possible if objects of the same shape must be grouped together and each object is a different color?

(B) In how many distinguishable ways can the objects be arranged in a row if objects of the same shape are also the same color, but need not be grouped together?

[10] **10.** A company needs to hire a new director of advertising. It has decided to try to hire either person A or person B, both of whom are assistant advertising directors for major competitors. To decide between A and B, the company does research on the campaigns managed by A or B (none are managed by both) and finds that A is in charge of twice as many advertising campaigns as B. Also, A's campaigns have yielded satisfactory results three out of four times, while B's campaigns have yielded satisfactory results only two out of five times. Suppose one of the competitors advertising campaigns is selected randomly.

(A) What is the probability that the selected campaign is satisfactory?

(B) Find the probability that either A runs the campaign or the results are satisfactory (or possibly both).

CONCORDIA UNIVERSITY
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Course	Number	Section(s)
Mathematics	206	AA
Examination	**Date**	**Pages**
Final	June 2016	3
Instructors		**Course Examiner**
L. Dube		D. Sen

Special Instructions

▷ **Only approved calculators are allowed.**

MARKS

[4] **1.** Simplify following expressions. Do not use a calculator.

(a) $5\sqrt{48} - 7\sqrt{27} + 2\sqrt{75}$ (b) $\frac{2}{3}\log_3 81 + \frac{1}{4}\log_2(5^2 - 9)$

[4] **2.** Rationalize the denominator:

(a) $\dfrac{\sqrt{3}}{5+2\sqrt{3}}$ (b) $\dfrac{4+\sqrt{5}}{\sqrt{2}-\sqrt{5}}$

[6] **3.** Simplify the expressions:

(a) $3x(x^4 + 2x^2 - 3x) + 4x(x^3 - 7^2 + 1)$ (b) $\dfrac{4x}{x^3 - 9x} - \dfrac{1}{x+3}$

[8] **4.** Factor the polynomials completely:

(a) $6x^2 + x - 15$ (b) $2x^4 - 54x$

[4] **5.** Perform the arithmetic operations and simplify:

$$\frac{-2x+3}{x^2+7x+12} - \frac{x+4}{x^2-16}$$

[9] **6.** Solve the equations:

(a) $\dfrac{x}{x-2}+\dfrac{2}{x+1}=\dfrac{7x+1}{x^2-x-2}$ (b) $\log_3(x+1)+\log_3(x+4)=2$

(c) $2(8)^x=256$

[8] **7.** Solve the inequalities, express your answer using bet notation or interval notation:

(a) $3x+4 \geq \dfrac{1}{3}(x-2)$ (b) $|1-2x|-4<-1$

[4] **8.** Solve the system of equations:

$$x^2+y^2=25$$
$$x^2-\tfrac{1}{2}y^2=19$$

[8] **9.** (a) The midpoint of the line segment P to Q is $(-1,4)$, if the coordinates of P is $(-3,6)$, what is the coordinates of Q?

(b) Write the equation of the circle: $x^2+y^2-x+2y+1=0$ in standard form; find the coordinates of the center and radius of the circle.

[6] **10.** Find the domain and range of the functions (do not graph):

(a) $f(x)=\dfrac{x+1}{x^2-9}$ (b) $g(x)=\sqrt{x+2}+2$

(c) $h(x)=\mid 3x-4 \mid +2$

[5] **11.** Sketch the graph of the function $f(x)=\ln(x+2)+3$ starting from the graph of $g(x)=\ln x$, and using proper transformations.

[8] **12.** Let $f(x)=\dfrac{3}{x-1}$, $g(x)=\frac{2}{x}$, Find:

(a) fg (b) $\dfrac{f}{g}$ (c) fog (d) gof

[8] **13.** (a) Find the inverse of the function: $f(x) = \dfrac{2x-3}{x+4}$

(b) Find vertical and horizontal asymptotes of both f and f^{-1}.

[5] **14.** Patrice can paint four rooms in 10 hours. If he hires John to help, they can do the job together in 6 hours. If he lets John work alone, how long it will take him to paint four rooms?

[5] **15.** A gardener has 46 feet to fencing to be used to enclose a rectangular garden that has a border 2 feet wide surrounding it. If the length of the garden is to be twice its width, what will be the dimensions of the garden?

[8] **16.** The number N of bacteria present in a culture at time t (in hours) obeys the law of uninhibited growth $N = 1000e^{0.01t}$:

(a) Determine the initial amount of bacteria.

(b) How long will it take the number of bacteria to reach 1700?

(c) What is the doubling time for the population?

CONCORDIA UNIVERSITY
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Course	Number		Section(s)
Mathematics	206/4		All
Examination	**Date**	**Time**	**Pages**
Final	April 2017	3 Hours	2
Instructors			**Course Examiner**
A. Butaev, I. Negrini, K. Lagota, U. Mgbemena			D. Sen

Special Instructions

▷ **Only approved calculators are allowed.**

MARKS

[4] **1.** Simplify the expressions below. Do not use a calculator.

(a) $5\sqrt{20} - \sqrt{45} + 2\sqrt{80}$ (b) $\frac{2}{3}\ln 8 - \ln(5^2 - 1)$

[4] **2.** Rationalize the denominator:

(a) $\dfrac{4-\sqrt{3}}{2-\sqrt{3}}$ (b) $\dfrac{1+\sqrt{7}}{2-\sqrt{5}}$

[6] **3.** Simplify the expressions:

(a) $5x^2(x^3 - x^2 - 4x + 5) - 4x(3x^4 - 2x^3 + 3x^2 + x)$ (b) $\dfrac{4x^2 + 8x}{12x + 24}$

[8] **4.** Factor the polynomials completely:

(a) $2x^2 - 9x + 4$ (b) $12x^2 + 7x - 10$

[4] **5.** Perform the arithmetic operations and simplify:

$$\frac{x}{x^2 - 7x + 6} - \frac{x}{x^2 - 2x - 24}$$

[9] **6.** Solve the equations:

(a) $\dfrac{2x+1}{9} - \dfrac{x+4}{6} = 1$ (b) $2\log_5 x = \log_5 9$

(c) $5^{x^2+8} = 125^{2x}$

[8] **7.** Solve the inequalities, express your answer using set notation or interval notation:

(a) $x(4x+3) \leq (2x+1)^2$ (b) $|1 - 4x| < 5$

[4] **8.** Solve the system of equations:

$$\begin{aligned} x^2 - y^2 &= 21 \\ x + y &= 7 \end{aligned}$$

[8] **9.** (a) Which of the points $A(2,4)$, $B(4,5)$ is closer to the point $C(1,5)$?

(b) Show that the equation $x^2 + y^2 + 4x - 6y + 12 = 0$ represents a circle. Find coordinates of the center and radius of the circle.

[6] **10.** Find the domain and range of the functions (do not graph):

(a) $f(x) = \dfrac{3x}{x^2 - 4}$ (b) $g(x) = \sqrt{3x - 12}$ (c) $h(x) = |x| + 4$

[5] **11.** Sketch the graph of the function $f(x) = \log(x - 4) + 2$, starting from the graph of the function $g(x) = \log x$ and using appropriate transformations.

[8] **12.** Let $f(x) = \dfrac{1}{2x - 1}$ and $g(x) = \dfrac{1}{x^2}$. Find:

(a) fg (b) $\dfrac{f}{g}$ (c) $f \circ g$ (d) $g \circ f$

[8] **13.** (a) Find the inverse of the function $f(x) = \dfrac{x+1}{x-2}$.

(b) Find the vertical and horizontal asymptotes of both f and f^{-1} above.

[5] **14.** A restaurant manager wants to purchase 200 sets of dishes. One design costs \$25 per set, while another costs \$45 per set. If she only has \$7400 to spend, how many of each design should be ordered??

[5] **15.** A movie theater charges \$9.00 for adults and \$7.00 for senior citizens. On a day when 325 people paid an admission, the total receipts were \$2495. How many who paid were adults? How many were seniors?

[8] **16.** The number N of bacteria present in a culture at time t (in hours) obeys the law of uninhibited growth

$$N(t) = 1000e^{0.01t}$$

(a) Determine the number of bacteria at $t = 0$ hours.

(b) What is the growth rate of the bacteria?

(c) When will the number of bacteria reach 1700?