

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	208/4	All except EC	
Examination	Date	Time	Pages
Final	April 2012	3 Hours	3
Instructors	Course Examiner		
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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 \$1.94 per bushel, the supply of corn is 9,800 million bushels and the demand is 9,300 million bushels. At a price of \$1.82 per bushel, the supply of corn is 9,400 million bushels and the demand is 9,500 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.
 - (D) Graph the price-supply equation, price-demand equation, and equilibrium point in the same coordinate system.
- [10] 2. Solve for x in the following equations:
- (A) $3^{3x-x^2} = \frac{1}{81}$
 - (B) $(81)^{2x} = (9)^{x^2-12}$
 - (C) $3 \log_b 2 + \frac{1}{2} \log_b 25 - \log_b 20 = \log_b x$
 - (D) $\log_5(x+6) + \log_5(x+2) = 1$
 - (E) $\log_4(x^2 + x + 4) = 2$

- [10] 3. For $f(x) = -22x + 16$ and $g(x) = 5(0.8)^x$, find the following:
- (A) $\sum_{k=0}^{40} f(k) = f(0) + f(1) + f(2) + \cdots + f(40)$
- (B) $\sum_{h=0}^{29} g(h) = g(0) + g(1) + g(2) + \cdots + g(29)$
- [10] 4. You have decided to take a two day "Earth Orbital Tour", offered by NASA Enterprises Inc. four years from now. 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 the date of departure date (four years from now). 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 save up for your Space vacation fund?
- [10] 5. The Perez family buys a house for \$275,000 with a down payment of \$55,000. They take out a 30 year mortgage for \$220,000 at an annual interest rate of 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. A corporation wants to lease a fleet of 12 airplanes with a combined carrying capacity of 220 passengers. The three available types of planes carry 10, 15, and 20 passengers, respectively.
- (A) How many of each type of plane should be leased?
- (B) The cost of leasing a 10-passengers airplane is \$8,000 per month, a 15-passengers airplane is \$14,000 per month, and a 20-passengers airplane is \$16,000 per month. Which of the solutions would minimize the monthly leasing cost?

- [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 \$0.3, \$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, 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 $P(x, y) = 15x + 5y$ subject to
- $$2x + y \leq 40, 20x + 2y \geq 36, 6x + 15y \geq 108, x \geq 0, y \geq 0.$$
- [10] 9. 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?
- [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 the 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.