

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)
Mathematics	208/4	All
Examination	Date	Pages
Final	April 2008	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. 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
- $$2x + 2y \geq 4, \quad 6x + 4y \leq 36, \quad 2x + y \leq 10, \quad x \geq 0, \quad y \geq 0.$$
- [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?