

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

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Course	Number	Section(s)
Mathematics	208/4	All (EXCEPT EC)
Examination	Date	Pages
Final	April 2009	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 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) $\log_{10}(x-1) - \log_{10}(x+1) = 1$

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- [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?