

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		
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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. 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 .

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

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

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

(D) Find the range of f .

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 ?