

FRANCESCA

CONCORDIA UNIVERSITY  
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	208/2	All except EC	
Examination	Date	Time	Pages
Final	December 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  $f(x) = 1.2 + 0.96x - 0.12x^2$
- (A) Find  $x$  and  $y$  intercepts algebraically.
  - (B) Find the vertex form of  $f$ .
  - (C) Find the vertex and the maximum or minimum.
  - (D) Find the range of  $f$ .

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

(A)  $\left(\frac{3}{4}\right)^x = \frac{16}{9}$

(B)  $(0.5)^{-3x^2+15x-72} = (0.5)^{-x^2+35x-22}$

(C)  $\log_3\left(\frac{x}{5}\right) + \log_3 7 + 2\log_3 \sqrt{5} = 3\log_3 \sqrt[3]{175} + 5\log_3 1$

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

(E)  $\log_2(\sqrt{2x^2}) - 1 = \frac{3}{2}$

[10] 3. For  $f(x) = -12x + 16$  and  $g(x) = 3(0.8)^x$  find the following:

$$(A) \sum_{k=0}^{49} f(k) = f(0) + f(1) + f(2) + \cdots + f(49).$$

$$(B) \sum_{h=0}^{24} g(h) = g(0) + g(1) + g(2) + \cdots + g(24).$$

[10] 4. Kelly sells some land in Quebec. She will be paid a lump sum of \$60,000 in 7 years. Until then, the buyer pays 8% simple interest quarterly.

- (A) Find the amount of each quarterly interest payment.  $I = 1200$
- (B) The buyer sets up a sinking fund so that enough money will be present to pay off the \$60,000. The buyer wants to make semiannual payments into the sinking fund; the account pays 6% compounded semiannually. Find the amount of each payment into the fund.  $PMT = 3511.58, 4128.51$
- (C) What is the amount in the sinking fund after the first two deposits.

[10] 5. A person purchased a house 10 years ago for \$160,000. The house was financed by paying 20% down and signing a 30-year mortgage at 7.75% on the unpaid balance with payments made monthly.

- (A) What is the unpaid balance after 120th payment?
- (B) After the 120th payment, the owner wishes to refinance the house due to a need for additional cash. If the loan company agrees to a new 30-year mortgage of 80% of the new appraised value of the house, which is \$225,000, how much cash will the owner receive after repaying the balance of the original mortgage?

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

$$2x_1 + 6x_2 + 15x_3 = -12$$

$$4x_1 + 7x_2 + 13x_3 = -10$$

$$3x_1 + 6x_2 + 12x_3 = -9$$

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

- [10] 7. An economy is based on three sectors, agriculture, energy, and manufacturing. Production of a dollar's worth of agriculture requires an input of \$0.20 from the agriculture sector and \$0.40 from the energy sector. Production of a dollar's worth of energy requires an input of \$0.20 from the energy sector and \$0.40 from the manufacturing sector. Production of a dollar's worth of manufacturing requires an input of \$0.10 from the agriculture sector, \$0.10 from the energy sector, and \$0.30 from the manufacturing sector.
- (A) Write the technological matrix  $M$  for this economy.
- (B) If a final demand of \$20 billion for agriculture, \$10 billion for energy, and \$30 billion for manufacturing 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. A small town has two radio stations: an AM station and an FM station. A survey of 100 town residents produced the following results: In the last 30 days, 65 people have listened to the AM station, 45 have listened to the FM station, and 30 have listened to both stations. During this 30-day period,
- (A) How many people in the survey have listened to the AM station but not to the FM station?
- (B) How many people in the survey have listened to the FM station but not to the AM station?
- (C) How many people in the survey have not listened to either station?
- [10] 10. A study on body types gave the following results: 45% were short, 25% were short and overweight, and 24% were tall and not overweight. Find the probabilities that a person is the following:
- (A) Overweight
- (B) Short, but not overweight
- (C) Tall and overweight