UNIVERSITY OF TORONTO SCARBOROUGH

MARCH 2010 MIDTERM EXAMINATION
MATA32H3 S
Calculus for Management I
Leo Goldmakher
Duration–2 hours
Aids: calculator

NAME (PRINT): _____

Last/Surname   First/Given Name

STUDENT NO: _____ **Name of TA:**_____

Please read the following statement and sign below:

I understand that any breach of academic integrity is a violation of The Code of Behaviour on Academic Matters. By signing below, I pledge to abide by the Code.

SIGNATURE:_____

Qn. #	Value	Score
1	10	
2	20	
3	10	
4	12	
5	18	
6	15	
Total	85	

You may find the following formulas helpful:

$$a + ar + ar^2 + \cdots + ar^{N-1} = a \times \frac{1 - r^N}{1 - r}$$

$$P(x) = P_0 \left(1 + \frac{r}{N}\right)^{Nx}$$

$$P_{\text{cont}}(x) = P_0 e^{rx}$$

(1) Given a constant k, let

$$f(x) = \begin{cases} 3x + 2k^2 & \text{for } x < 5 \\ x^2 + 2k + 2 & \text{for } x \geq 5 \end{cases}$$

10 points

Find all values of k for which $f(x)$ is a continuous function. Show all relevant work.

(2) You wish to buy a car which is currently selling for $20,000. Since you don't have that much money to spend, you make the following arrangement with the seller:

20 points

(i) You pay $5000 upfront.

(ii) You pay off the balance in equal monthly installments, paid at the end of every month for the next two years, at an interest rate of 12% APR compounded monthly.

a) How much is the first installment? (Show all work.)

b) What is the finance charge? (Recall that the finance charge is the total interest paid.)

(3) Determine the least number of months required for a principal of P dollars to increase by 50% at an 8% APR compounded semiannually. (Show all work.)

10 points

(4) Suppose you owe someone \$8,000. You agree to pay off the debt according to the following plan:

    (i) you pay \$1000 at the end of the first year;

    (ii) you pay \$3000 at the end of the 3rd year;

    (iii) you pay the rest at the end of the 6th year.

Assume an interest of 10% APR compounded semiannually. What is the amount of the final payment? (Show all work.)

12 points

(5) Let $g(x) = \sqrt{\dfrac{2x - 2}{x - 2}}$. For each of the following, choose the most

3 points each

appropriate answer. You do not need to justify your choice.

i) $\lim\limits_{x \to 0} g(x) = $ _____

(a) 0   (b) 1   (c) 2   (d) $\sqrt{\frac{1}{2}}$ (e) $\sqrt{2}$ (f) ∞ (g) $-\infty$
(h) none of the above.

ii) $\lim\limits_{x \to 1} g(x) = $ _____

(a) 0   (b) 1   (c) 2   (d) $\sqrt{\frac{1}{2}}$ (e) $\sqrt{2}$ (f) ∞ (g) $-\infty$
(h) none of the above.

iii) $\lim\limits_{x \to 2^-} g(x) = $ _____

(a) 0   (b) 1   (c) 2   (d) $\sqrt{\frac{1}{2}}$ (e) $\sqrt{2}$ (f) ∞ (g) $-\infty$
(h) none of the above.

iv) $\lim\limits_{x \to 2^+} g(x) = $ _____

(a) 0   (b) 1   (c) 2   (d) $\sqrt{\frac{1}{2}}$ (e) $\sqrt{2}$ (f) ∞ (g) $-\infty$
(h) none of the above.

v) $\lim\limits_{x \to -\infty} g(x) = $ _____

(a) 0   (b) 1   (c) 2   (d) $\sqrt{\frac{1}{2}}$ (e) $\sqrt{2}$ (f) ∞ (g) $-\infty$
(h) none of the above.

vi) $\lim\limits_{x \to \infty} g(x) = $ _____

(a) 0   (b) 1   (c) 2   (d) $\sqrt{\frac{1}{2}}$ (e) $\sqrt{2}$ (f) ∞ (g) $-\infty$
(h) none of the above.

(6) Suppose that the amount of Carbon-14 present in an old wooden tool is 20% of the amount the tool originally contained (i.e. when it was made). Given that the amount of Carbon-14 in inanimate objects decays exponentially and has a half life of 5730 years, estimate the age of the tool. Show all work.

15 points

Scratch paper.

Total Marks = 85 points