Université d'Ottawa · University of Ottawa
Faculté des sciences
Mathématiques et de statistique
Faculty of Science
Mathematics and Statistics

MAT1330 D: Calculus for life sciences I
Instructor: Aziz Khanchi

Test I-Blue
February 2011

Surname _____ First Name _____

Student # _____

Take your time to read the entire paper before you begin to write, and read each question carefully. Make a note of the questions that you feel confident you can do, and then do those first: you do not have to proceed through the paper in the order given.

- You have 80 minutes to complete this exam. You can use the back of the pages to write your solutions.
- This is a closed book exam, and no notes of any kind are allowed. The use of cell phones, pagers or any text storage or communication device **is not permitted.**
- Only the Faculty Texas Instrument and Casio calculators are allowed.
- The correct answer requires justification written legibly and logically: you must convince me that you know why your solution is correct. Answer these questions in the space provided. Use the backs of pages if necessary.
- Where it is possible to check your work, do so.
- Good Luck!

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Q1	Q2	Q3	Q4	Q5	Total
/4	/9	/10	/5	/4	/32

Question 1. Solve the following equations:

a) $x^2 - x = 3\log_5 25$

$x =$ ☐

b) $8e^{3x} = 32$

$x =$ ☐

Question 2. To make the birds happy, Monique deposits 40 grams of sunflower seeds at the beginning of each week in a conspicuous place. During the week, the birds eat 1/2 of seeds available. The dynamical system modeling the quantity of seeds is

$$G_{t+1} = 0.5G_t + 40$$

where t is in weeks.

a) Find the updating function of the DTDS. $\square$

b) Find the equilibrium point of the DTDS.

$x^* = \square$

c) Give the solution formula for the DTDS with initial condition $G_0 = 12$:

$G_t = \square$

d) Calculate G_{13} if $G_0 = 12$.

$G_{13} =$ [ ]

e) Graph the updating function and draw the cobweb diagram of the DTDS, starting from $G_0 = 4$ for 4 steps.

Question 3. Evaluate the following limits. If a limit does not exist determine if it is $-\infty, \infty$ or neither.

a) $\lim_{x\to 2} \dfrac{x-2}{x^2-4} =$

b) $\lim_{x\to 0} \dfrac{-x^{2012}+2}{2x^2+10} =$

c) $\lim_{x\to 25} \dfrac{x-25}{\sqrt{x}-5} =$

d) $\lim_{x\to 3^+} \dfrac{3x}{(x-3)^5} =$

e) $\lim_{x\to 3^-} \dfrac{3x}{(x-3)^5} =$

f) $\lim_{x\to \infty} \dfrac{x^6-3x+5}{3x^6-9} =$

g) $\lim_{x\to 1^-} \dfrac{x^2-3x}{x-1} =$

Question 4. Consider the function $f(x) = \dfrac{|x + \frac{1}{2}| - |x - \frac{1}{2}|}{x}$.

a) Determine the domain of f.

$D_f =$ [ ]

b) Write f as a piecewise function without the absolute value.

Question 5. During one year, Ottawa receives maximum sunlight for 16 hours and a minimum of 8 hours sunshine. The maximum occurs in June, and the minimum in the month of December. Assuming that the number of sunshine hours varies according to a sinusoidal function of the classical form:

$$f(t) = A + B\cos\left(\frac{2\pi}{T}(t-\Phi)\right),$$

where t is the month of the year with t = 0 corresponding to the month of January.

Find the parameters in the standard cosine description.

$A =$ $T =$ $B =$ $\Phi =$

Draw the graph of the function for at least one period and identify the above four parameters on the graph.