

SIMON FRASER UNIVERSITY
DEPARTMENT OF MATHEMATICS

Final

MATH 100 Spring 2008

Instructor: Dr. Chávez Lomelí

April 15, 2008, 3:30 – 6:30 p.m.

Name: _____ (please print)
family name *given name*

SFU ID: _____
student number *SFU-email*

Signature: _____

Instructions:

1. Do not open this booklet until told to do so.
2. Write your name above in block letters. Write your SFU student number and email ID on the line provided for it. Put your signature on the line provided.
3. Write your answer in the space provided below the question . If additional space is needed then use the back of the previous page. Your final answer should be simplified as far as is reasonable.
4. To receive full credit for a particular question your answer must be complete and well presented.
5. This exam has 12 questions on 11 pages (not including this cover page). Once the exam begins please check to make sure your exam is complete.
6. **No** calculators, books, papers, or electronic devices shall be within the reach of a student during the examination.
7. **During the examination, communicating with, or deliberately exposing written papers to the view of, other examinees is forbidden.**

Question	Maximum	Score
1	12	
2	5	
3	6	
4	5	
5	4	
6	13	
7	11	
8	10	
9	13	
10	6	
11	7	
12	8	
Total	100	

1. Let $f(x) = \log_2(x)$, $g(x) = \sin\left(\frac{\pi}{2}x\right)$ and $h(x) = \begin{cases} 2^{-x} & \text{if } x > 0 \\ -3x^2 - 4x + 1 & \text{if } x \leq 0 \end{cases}$

Evaluate the following:

[2] (a) $(h \circ f)(4)$

[2] (b) $\left(\frac{g}{h}\right)(0)$

[2] (c) $g(-1/3)$

[2] (d) $g\left(\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)\right)$

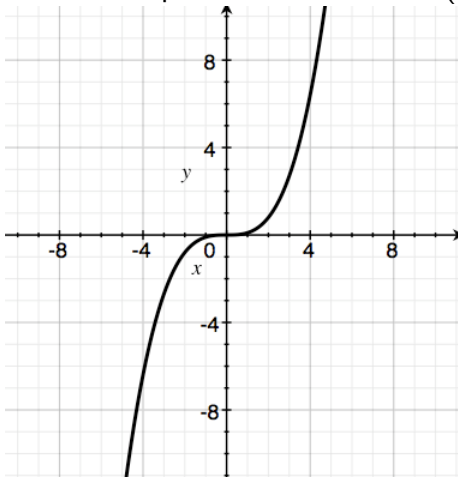
[4] (e) $\tan^2(\cos^{-1}(4/5))$

2. Consider the line L_1 given by the equation $y = 4x - 5$.

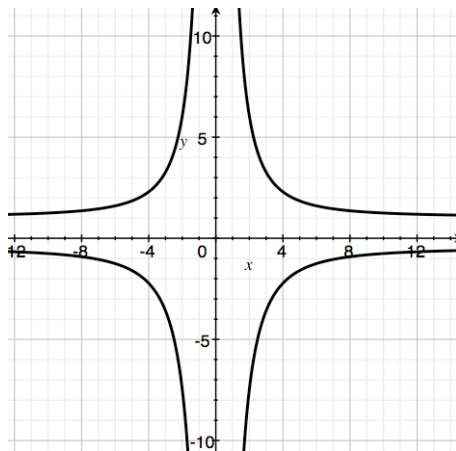
[2] (a) Find the equation of the line L_2 perpendicular to L_1 going through the point $(16, 8)$.

[3] (b) Find the coordinates of the point of intersection of the lines L_1 and L_2 . **Do not** use the graph.

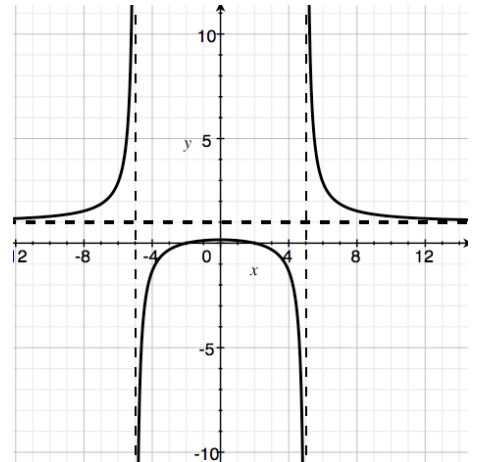
3. The following graphs show relations defined over the real numbers. Answer the following questions about them (refer to each graph by its label).



[1]



[2]



[3]

- [1] (a) List all the graphs which are graphs of functions, if any.

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- [1] (b) List all the graphs of **one-to-one** functions, if any.

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- [1] (c) List all even functions, if any.

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- [1] (d) List all odd functions, if any.

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- [2] (e) For each of the functions shown, state all the intervals on which they are **increasing**.

- [5] 4. The height of an arrow t seconds after it is fired is given by the function $h(t) = -8t^2 + 48t + 128$. Determine the maximum height of the arrow and the time t when it reaches this maximum height.

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- [4] 5. Find the equation of the circle with center at $(2, -1)$ and going through the point $(5, 4)$.

6. Find the solutions to the following:

[4] (a) $\sec^2 x = 2 \sec x$.

[4] (b) $2^{2x+1} - 2^{x+2} + 8 = 0$.

[5] (c) $\ln(x - 3) + \ln x - \ln(x + 2) = \ln 4$.

7. Let $p(x) = 3x^4 - 2x^3 + x - 5$.

[1] (a) Describe the end behavior of $p(x)$. You may use a picture.

[1] (b) Find the y -intercept of the graph of $p(x)$.

[4] (c) Find the quotient $\frac{p(x)}{x+1}$. State the quotient and residue.

[5] (d) Find the coordinates of the points of intersection of the graphs of $p(x)$ and $q(x) = 3x^4 - 4x^2 + 3x - 5$.

8. Let $f(x) = \frac{3x(x^4 - 9)}{5x(x^2 - 4)}$.

[4] (a) Find the intercepts of the graph of $f(x)$.

[4] (b) Find all holes **and** asymptotes of the graph of $f(x)$.

[2] (c) Determine if the f is even, odd or neither.

9. Let $f(x) = \tan\left(\frac{x}{2} - \frac{\pi}{4}\right)$.

[3] (a) Find the period of f .

[3] (b) Find all the intercepts of f .

[3] (c) Find all the asymptotes of f .

[4] (d) Sketch one period of the graph of f . Clearly indicate the locations of intercepts and asymptotes.

- 10.** You are flying a kite and you find that when the length of the string from your hand to the kite is 30m the kite is at a height of 15m over the level of your hand. Draw a picture and answer the following questions about it.

[2] (a) What is the angle, with vertex at your hand, formed by the string of the kite and the horizontal line at the level of your hand?

[2] (b) What is the angle, with vertex at the kite, formed by the string of the kite and the vertical line perpendicular to the ground?

[2] (c) What is the horizontal distance between you and the kite?

- 11.** A population of bacteria grows according to an exponential model. The initial size of the population is P_0 and 45 minutes later the population has grown to a size of $3P_0$.

[4] (a) Give an equation for the size $P(t)$ of the population, after t seconds. Find all parameters involved.

[3] (b) What is the doubling time of this population?

- 12.** Determine if each of the following statements is **TRUE** or **FALSE**. Mark the correct answer and write down all your work or provide an explanation.

[2] (a) The polynomial $p(x) = 3x^4 - x^2 - 7x - 2$ has 6 different zeroes.

[TRUE] [FALSE]

[2] (b) The inverse of $f(x) = 3x - 6$ is $f^{-1}(x) = \frac{x}{3} + 2$.

[TRUE] [FALSE]

[2] (c) The graph of a rational function never crosses a vertical asymptote.

[TRUE] [FALSE]

[2] (d) The amplitude of $y = -3\sin(2x - 1)$ is 2.

[TRUE] [FALSE]