

Simon Fraser University

Math 100

Final Exam

Date: December 12, 2007

Time: 15:30 - 18:30

Last Name (print): _____ **First Name** _____

Signature: _____ **SFU Email ID:** _____

Instructions:

1. Do not open this exam until instructed to do so.
2. No calculators, notes or books are allowed.
3. When presenting a final answer for your solution, calculator-ready expressions will be given full credit.
4. Show all your work. **No credit** will be given for an answer without the correct accompanying work.
5. Answer the questions in the space provided. Continue on the back of the previous page if necessary.
6. There are 80 possible points in this examination.
7. **During the examination, communicating with, or deliberately exposing written papers to the view of, other examinees is forbidden.**

Question	1	2	3	4	5	6	7	8	9	10	11	Total
Mark												
Maximum	2	5	9	13	11	5	7	6	7	6	9	80

- [2 pts] 1. Find the solution to the system of linear equations:

$$4x - 3y = 5$$

$$2x - y = 4$$

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- [5 pts] 2. Find the coordinates of the center and the radius of the circle with equation $x^2 + y^2 + 6x - 4y = 5$.

3. Let $f(x) = \ln(x - 5)$ and $g(x) = \left|\frac{5}{2}x\right|$

[1 pts] (a) Find the range of $g(x)$

[1 pts] (b) Determine the domain of $f(x)$.

[2 pts] (c) Find an expression for $h(x) = (g \circ f)(x)$

[2 pts] (d) Does $h(x)$ have an inverse? Answer **yes** or **no** and give a short explanation for your answer.

[3 pts] (e) Find the interval in which $h(x)$ is increasing and that in which it is decreasing.

4. Find all solutions to the following:

[6 pts] (a) $\log_2(x - 6) + \log_2(x - 4) - \log_2 x = 2$

[4 pts] (b) $3 \sin^4 x - 6 \sin^2 x + 3 = 0$

[3 pts] (c) $\frac{x^3 - 16x}{2x + 8} = 0$

5. Evaluate the following expressions.

[2 pts] (a) $\log_3(\log_2 8)$

[2 pts] (b) $\cos(\sin^{-1}(-\frac{1}{2}))$

[2 pts] (c) $\sum_{i=1}^4 i^2$

[2 pts] (d) $\cos^{-1}\left(\cos \frac{5\pi}{4}\right)$

[3 pts] (e) $p(-3)$, where $p(x) = x^4 - 3x^2 + 8x - 2$, **using the remainder theorem.**

6. Consider the parabola with equation $T(x) = 4x^2 - 12x - 7$.

[3 pts]

(a) Give the coordinates of the vertex of the parabola.

[1 pts]

(b) Find the equation of the axis of the parabola

[1 pts]

(c) Does the vertex correspond to a maximum or a minimum ?

7. Consider the function $p(t) = \frac{x^3 - 9x}{4x(x + 3)(2x - 7)}$.

[2 pts] (a) Find the domain of $p(t)$

[3 pts] (b) Determine all asymptotes of $p(t)$.

[2 pts] (c) Find the x and y -intercepts of the graph of $p(t)$, if they exist.

8. Andy and Beth are standing 8m apart from each other, trying to read a sign which is some distance away from both of them. The angle formed by Andy's line of vision to the sign and his line of vision to Beth is $\pi/3$. The angle formed by Beth's line of vision to the sign and her line of vision to Andy is $\pi/6$.

[4 pts]

- (a) Find the distance between Andy and the sign.

[2 pts]

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- (b) **Using the Pythagorean identity**, find the distance between Beth and the sign.

9. Answer the following questions about the function $g(x) = -\frac{4}{3} \cos(2x + \pi)$.

[1 pts] (a) What is the amplitude of $g(x)$.

[1 pts] (b) State the period of $g(x)$.

[1 pts] (c) State the phase shift of $g(x)$.

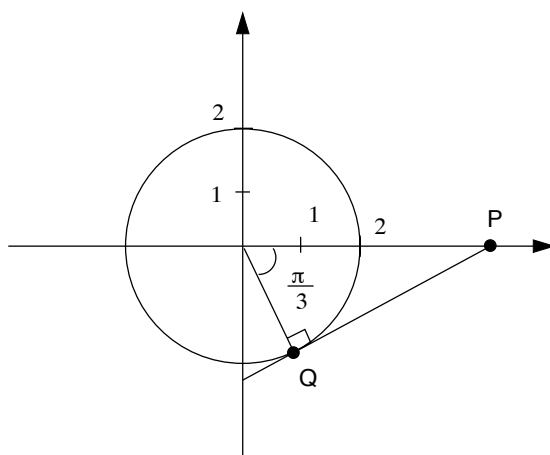
[4 pts] (d) Plot one cycle of the graph of $g(x)$, labeling all important points.

10. Recall that the half-life of Carbon-14 (C-14) is 5730 years.

- [3 pts] (a) Give the radioactive decay model for the amount of C-14 that remains after t years.

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- [3 pts] (b) If you found today an old bone containing 70% of its original amount of C-14, how old would that bone be?

11. This question is based on the following diagram:



[3 pts]

(a) Find the coordinates of the point Q.

[4 pts]

(b) Find the equation of the line through P and Q.

[2 pts]

(c) Find the coordinates of P.