

Math 10250

Name: _____

Exam 1

Instructor: _____

September 19, 2006

Section: _____

Calculators are allowed. Do not remove this answer page – you will return the whole exam. You will be allowed 1 hour and 15 minutes to do the test. You may leave earlier if you are finished.

Part I consists of 10 multiple choice questions worth 5 points each. Record your answers by placing an \times through one letter for each problem on this answer sheet.

Part II consists of 5 pages of partial credit problems worth a total of 50 points. Write your answer and show **all** your work on the page on which the question appears.

You are taking this exam under the honor code.

GOOD LUCK

1. ☐ a ☐ b ☐ c ☐ d ☐ e

6. ☐ a ☐ b ☐ c ☐ d ☐ e

2. ☐ a ☐ b ☐ c ☐ d ☐ e

7. ☐ a ☐ b ☐ c ☐ d ☐ e

3. ☐ a ☐ b ☐ c ☐ d ☐ e

8. ☐ a ☐ b ☐ c ☐ d ☐ e

4. ☐ a ☐ b ☐ c ☐ d ☐ e

9. ☐ a ☐ b ☐ c ☐ d ☐ e

5. ☐ a ☐ b ☐ c ☐ d ☐ e

10. ☐ a ☐ b ☐ c ☐ d ☐ e

For grading use:

Q1- Q10	
Pg. 5	
Pg. 6	
Pg. 7	
Pg. 8	
Pg. 9	
Total	

Part I: Multiple Choice Questions (5 Points Each)

1. The demand for a certain iPod model is 25,000 units (on the average per day) when its price is \$200 per unit. However, when its price drops by \$50 then its demand increases by 5,000 units. Find the demand function assuming that it is linear.

(a) $D(p) = 100p + 25,000$

(b) $D(p) = -100p + 45,000$

(c) $D(p) = -10p + 25,000$

(d) $D(p) = -10p + 45,000$

(e) $D(p) = -100p - 45,000$

2. Suppose that $\log_3 a = 5$. Find the exact value of $\log_3 \left(\frac{9}{a} \right)$.

(a) -1

(b) 3

(c) -3

(d) 2

(e) 1

3. You have just put \$3,000 in a certificate earning annual interest 8% compounded **quarterly**. Find how much it will be worth 3 years later.

(a) $3,000(0.92)^4$ (b) $3,000(1.08)^{12}$ (c) $3,000e^{12}$ (d) $3,000e^{2.4}$ (e) $3,000(1.02)^{12}$

4. Compute the following limit: $\lim_{x \rightarrow 5} \frac{x^2 - 3x - 10}{x - 5}$

- (a) 7 (b) -5 (c) -3 (d) -10 (e) Limit does not exist.

5. Let $f(x) = 2 \ln(x + 3) - 1$. What is the natural domain of $f(x)$?

- (a) $(3, \infty)$ (b) $(-3, \infty)$ (c) $(2, \infty)$ (d) $(-1, \infty)$ (e) $(-\infty, \infty)$

6. Assume that $f(x)$ is a continuous function on the interval $[-1, 2]$ with the following table of values:

x	-1	0	1	2
$f(x)$	-2	3	2	0

In which of the following intervals

I. $[-1, 0]$

II. $[0, 1]$

III. $[1, 2]$

can you be sure that the function $f(x) = 1$ has at least one solution?

- (a) **I** only (b) **II** only (c) **III** only (d) **I** and **III** (e) none

7. A certain radioactive substance **decays exponentially**, that is $y = y_0 e^{-kt}$, where t is counted in days and y in grams. At the beginning of the first day there is 80 grams of the substance, and at the end of **five days** it reduces to 40 grams. Find the value of k .

(a) $k = 80 \ln 2$

(b) $k = 5 \ln 2$

(c) $k = 40 \ln 2$

(d) $k = \frac{\ln 2}{5}$

(e) $k = 40 \ln 5$

8. Which of the functions below is the inverse of $f(x) = \frac{2}{x+1}$?

(a) $g(x) = \frac{2-x}{x}$

(b) $g(x) = \frac{2+x}{x}$

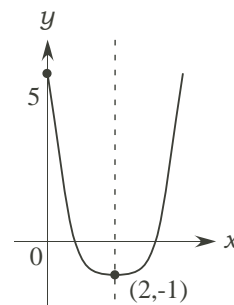
(c) $g(x) = \frac{x}{2-x}$

(d) $g(x) = \frac{x+1}{2}$

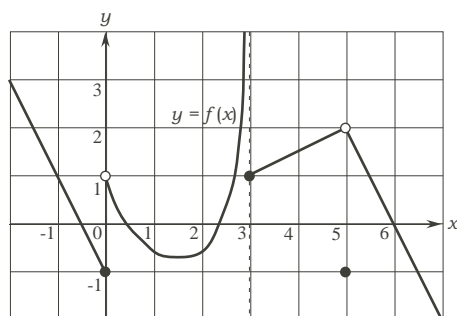
(e) $g(x) = \frac{x}{x-2}$

9. Determine which of the quadratic functions below has the graph as shown on the right.

- (a) $2(x - 1)^2 + 5$
- (b) $1.5(x + 2)^2 + 1$
- (c) $(x - 2.5)^2 - 1.25$
- (d) $5(x + 1)^2 + 2$
- (e) $1.5(x - 2)^2 - 1$



10. Let $f(x)$ be a function whose graph is shown below. Which of the following statements is **not** true?



- (a) $\lim_{x \rightarrow 5} f(x) = 2$.
- (b) $\lim_{x \rightarrow 3^+} f(x)$ is finite.
- (c) $f(x)$ is continuous at $x = 5$.
- (d) $f(x)$ is not continuous at $x = 0$.
- (e) $\lim_{x \rightarrow 0^+} f(x) = 1$ and $\lim_{x \rightarrow 0^-} f(x) = -1$.

Part II: Partial Credit Questions (10 Points Each)

Show all work and put your final answer in the space provided. **No credit** will be given for a correct answer without showing how it was obtained. You will receive no credit if the answer is not in the space provided and no **partial credit** for a wrong answer if you do not **show your work**.

11. Find the **equations** of **all** vertical and horizontal asymptotes of the following function. If there is none, circle “NONE”.

$$f(x) = \frac{5x^2 - 5}{x^2 - 3x + 2}$$

Equations

Vertical: _____ NONE

Horizontal: _____ NONE

12. Find the equation of the straight line passing through the point $(1, -3)$, and parallel to the line $4x + 2y = 6$ (i.e. both lines have the same slope).

Answer: _____

13. The price for a particular route of an airline company is $p = -0.05x + 900$, where x is the number of tickets sold per week and p is the price per ticket in dollars. On the cost side, the airline has a \$2,500,000 fixed cost and \$50 expenses per passenger.

(i) Find the cost function in terms of x .

(ii) Find the revenue function in terms of x .

(iii) Find the profit function in terms of x .

14. Complete the square of the quadratic function: $f(x) = -3x^2 + 24x + 2$

15. For the function

$$f(x) = \begin{cases} \frac{x^2 - 1}{x - 1}, & x \neq 1 \\ 3, & x = 1, \end{cases}$$

answer questions (a) and (b) below.

(a) What is the value of $\lim_{x \rightarrow 1} f(x)$? Show your work.

(b) Is $f(x)$ continuous at $x = 1$? Explain with limits.

16. Find $\lim_{h \rightarrow 0} \frac{(3 + h)^2 - 9}{h}$.

17. Biologists studying whale migration patterns calculate that for the last 20 years the number of whales that swim past a certain peninsula each year is approximately modeled by

$$W(t) = 300 + \frac{800}{t + 2}$$

where t is the time in years. Use limits to predict the number of whales that will swim past the specific peninsula many years from now.

18. What should the annual interest rate (compounded continuously) be in order that an amount of money earning this rate double in 10 years?

19. Imagine that you are offered two retirement plans.
- (A) When you are 30 years old \$100,000 is deposited into an IRA, earning annual interest 8% compounded **continuously**, till you become 65 years old.
 - (B) When you are 65 you receive \$1,500,000.
- Which one will you choose (Plan (A) or Plan (B))? Explain.

20. If \$1,000 is put in an account paying 5% annual interest, compounded **daily**, how much will there be at the end of 100 days?

