

Math 110
Final Exam
March 23, 2007

Name: _____

1. Your exam contains 12 questions and 10 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values for problems vary and these are clearly indicated. You have 120 minutes for this exam.
3. Make sure to ALWAYS SHOW YOUR WORK; you will not receive any partial credit unless all work is clearly shown. If in doubt, ask for clarification.
4. If you need extra space, use the back of the page and clearly indicate this.
5. You are allowed one 8.5×11 sheet of handwritten notes (both sides). Graphing and scientific calculators are allowed.

| Problem | Total Points | Score |
|---------|--------------|-------|
| 1 | 8 | |
| 2 | 6 | |
| 3 | 16 | |
| 4 | 4 | |
| 5 | 4 | |
| 6 | 8 | |
| 7 | 8 | |
| 8 | 10 | |
| 9 | 12 | |
| 10 | 6 | |
| 11 | 12 | |
| 12 | 6 | |
| Total | 100 | |

1. (8 points) Let $f(x) = \sqrt{2x + 4}$.

(a) What is the domain of $f(x)$?

(b) Find the average rate of change from $x = 0$ to $x = 6$.

2. (6 points) Let $g(x) = -2x^2 + 8x - 7$.

(a) Express $g(x)$ in vertex form.

(b) What is the maximum value of $g(x)$?

3. (16 points) Let $f(x) = x^2 + 2x$ and $g(x) = 3x - 1$. Find each of the following, and simplify your answers:

(a) $(f + g)(x)$.

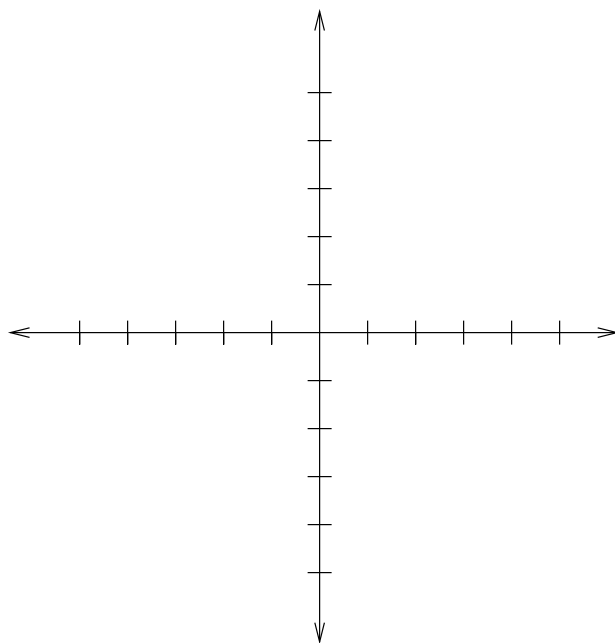
(b) $(fg)(2)$.

(c) $(g \circ f)(-1)$.

(d) $(f \circ g)(x)$.

4. (4 points) Let $h(x) = 2 + \sqrt[5]{x-1}$. Find a formula for $h^{-1}(x)$.

5. (4 points) Let $f(x)$ be the function given in the following graph.



Estimate the following:

(a) $f(-2)$

(b) $f^{-1}(1)$

6. (8 points) Divide. Express your answer in the form $Q(x) + \frac{R(x)}{D(x)}$.

(a) $\frac{x^4 - 2x^2 + 8x - 14}{x^2 - 3}$

(b) $\frac{x^4 - 3x^3 + 3x - 1}{x - 2}$

7. (8 points) Find all real zeros of $p(x) = x^3 - x^2 + 13x + 15$.

8. (10 points) Let $r(x) = \frac{x^2+5x+4}{x-1}$.

(a) State all x - and y -intercepts of $r(x)$.

(a) Clearly state the equation(s) of any asymptote(s) of $r(x)$.

9. (12 points) Evaluate:

(a) $\log_2 8$

(b) $\log_5 5^{x+2}$

(c) $\log_4 2$

(d) $\log_7 1$

(e) $\log_3\left(\frac{1}{3^x}\right)$

(f) $10^{\log(2x)}$

10. (6 points) Expand the expression: $\ln\left(\frac{\sqrt{x}}{y^2 z}\right)$

11. (12 points) Solve for x . Round answers to the nearest hundredth.

(a) $3^{x-1} = 7$

(b) $e^{2x} + 4e^x - 5 = 0$

(c) $\log_2(x^2 - 5x - 2) = 2$

12. (6 points) A rabbit population starts with 200 rabbits and grows exponentially. After 8 days, the population is 250 rabbits.

(a) Find a function that models the number of rabbits $n(t)$ after t days.

(b) How long will it take for the rabbit population to double?

Extra Credit (4 points): Let $f(x) = 3e^{x+2} - 5$. Find the formula for $f^{-1}(x)$.