

Math 110
Final Exam
Spring 2007
Version 1

1. (a) (6 points) Let $f(x) = 2^x$. Find the average rate of change from $x = 0$ to $x = 3$.

- (b) (8 points) Let $g(x) = x^2 - 3x + 4$. Find the average rate of change from $x = 2$ to $x = 2 + h$.

2. (8 points) A rock is thrown upward. It's height (in feet) above the ground after t seconds is given by $h(t) = -16t^2 + 48t + 5$. What is the maximum height the rock reaches?

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

 - (b) $(fg)(-1)$.

 - (c) $(f \circ g)(0)$.

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

4. (7 points) Suppose you are given the graph of a function $y = f(x)$. Clearly describe what steps you would take to draw the graph of $y = -2f(x - 5) + 3$ using the graph of $f(x)$.

5. (6 points) Let $f(x) = \frac{x^3 - 4}{2}$. Find a formula for $f^{-1}(x)$.

6. (6 points) Divide $P(x) = x^4 - 3x^3 + 2x - 5$ by $D(x) = x^2 - x + 1$. Express your answer in the form $Q(x) + \frac{R(x)}{D(x)}$.

7. Let $P(x) = x^3 - x^2 - 10x - 8$.

(a) (4 points) Find all *possible* real zeros of $P(x)$.

(b) (6 points) Determine which of the possible zeros in (a) are actually zeros of $P(x)$.

8. (7 points) Let $r(x) = \frac{x^2 - 3x - 10}{x - 2}$. State all x - and y -intercepts of $r(x)$.

9. (6 points) Use Laws of Logarithms to expand the expression: $\log_2 \left(\frac{5x^3}{y^2} \right)$

10. (6 points) What is the domain of $\ln(6 - 2x)$?

11. (6 points) A circle centered at $(-2, 5)$ passes through the point $(0, 5)$. Give the equation of the circle.

12. (8 points) A town is founded with 6,000 people and its population growing exponentially. After 5 years, the population of the town is 9,000 people. Find a formula $n(t)$ which gives the population of the town after t years.