

MTH 121
Exam 3
Spring 2013

Justify your answers with *neat and organized* work. 100 points possible.

These formulas may or may not be useful:

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \qquad a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad x = \frac{-b}{2a} \qquad m = \frac{y_2 - y_1}{x_2 - x_1}$$

1. (10 pts.) Solve the inequality and graph the solution on the real number line.

$$x^2 + 3 < 4x$$

2. (10 pts.) Find the slope-intercept form of the equation of the line passing through the points.

$$(1, -2) \qquad (4, 7)$$

3. (10 pts.) Let $f(x) = 5 + 4x - 2x^2$. Evaluate each of the following and simplify.

(a) $f(-3)$

(b) $f(x + h)$

4. (10 pts.) Let

$$f(x) = \begin{cases} x + 8, & x < -3 \\ -2x, & -3 \leq x \leq 3 \\ -6, & x > 3. \end{cases}$$

Evaluate each of the following and simplify.

(a) $f(4)$

(b) $f(-6)$

5. (10 pts.) Let $f(x) = x^2 - 2$ and $g(x) = 3x + 1$. Find each function and simplify.

(a) $f \circ g$

(b) $g \circ g$

6. (10 pts.) Find the equation of the quadratic function (parabola) that has the indicated vertex and whose graph passes through the given point.

Vertex: $(2, -4)$; point: $(8, -2)$

7. (10 pts.) Find the inverse function of f .

$$f(x) = \frac{3x + 5}{-2x + 1}$$

8. (10 pts.) Use long division to divide. If there is a remainder, write the answer like this example.

$$\left[\text{Example: } \frac{x^2 - x + 3}{x + 1} = x - 2 + \frac{5}{x + 1} \right]$$

$$(8x^3 - 4x^2 + 2x + 5) \div (2x + 3)$$

9. (10 pts.) Put in simplest exponential form: (1) no radicals, and (2) positive exponents only.

$$\frac{(x^{-5}y^{-3})^2}{(x^2y)^3}$$

10. (10 pts.) Combine into a single fraction and simplify.

$$\frac{x^2 - 8x}{x^3 + 4x^2} \div \frac{x^2 - 64}{x^3}$$