MTH 121
Exam 4
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. (8 pts.) Use **synthetic division** (*not* long division) to divide. Show your work. If there is a remainder, write the answer like this example.

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

$$(x^4 + 4x^3 + 5x^2 + 20) \div (x + 3)$$

2. (8 pts.) Use **synthetic division** (*not* long division) to divide. Show your work. If there is a remainder, write the answer like this example.

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

$$(3x^3 - 5x + 6) \div (x - 2)$$

3. (12 pts.) Find the vertex and focus of the parabola and sketch its graph.

$$x = -\tfrac{1}{8}y^2$$

4. (12 pts.) Find the standard form of the equation of the hyperbola with the given characteristics and center at the origin.

Vertices: $(0, \pm 5)$; foci: $(0, \pm 9)$

5. (12 pts.) Find the center and vertices of the ellipse, and sketch its graph. (Optional, for bonus points: find the foci.)

$$16x^2 + 25y^2 - 96x - 100y - 156 = 0$$

6. (12 pts.) (a) Solve by the method of elimination, showing all work. (b) Graph both lines and their intersection.

$$\begin{aligned} x + 2y &= 4 \\ 3x - 3y &= -15 \end{aligned}$$

7. (12 pts.) Perform the pivot on the entry marked with an asterisk ($*$).

$$\left[\begin{array}{rrr|r} 2 & 1 & -3 & -4 \\ -4 & 6 & 2* & -2 \\ 3 & -2 & 5 & -7 \end{array}\right]$$

8. (8 pts.) Put in simplest exponential form: (1) no radicals, and (2) positive exponents only.

$$\frac{(3a^{-5})^3}{(12a^4)^2}$$

9. (8 pts.) Find the slope-intercept form of the equation of the line passing through the points.

$$(2, 7) \qquad (-1, -11)$$

10. (8 pts.) Let $f(x) = x^2 - 3$ and $g(x) = 4x + 5$. Find the function and simplify.

$$f \circ g$$