

MTH 121
Some Review Problems for Exam 4
Spring 2013

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

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

$$(x^4 + 5x^3 - 2x - 7) \div (x + 5)$$

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

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

$$(2x^4 - 7x^3 + 7x + 6) \div (x - 3)$$

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

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

$$(-3x^4) \div (x - 2)$$

4. Find the polynomial $Q(x)$ and the constant R .

$$2x^3 + 5x^2 + 4 = (x + 3)Q(x) + R$$

5. Find the vertex and focus of the parabola and sketch its graph.

$$y = \frac{1}{2}x^2$$

6. Find the standard form of the equation of the parabola with the given characteristic and vertex at the origin.

Directrix: $y = 2$

7. Find the center and vertices of the ellipse and sketch its graph.

$$\frac{x^2}{25} + \frac{y^2}{16} = 1$$

8. Find the standard form of the equation of the ellipse with the given characteristics and center at the origin.

Vertices: $(\pm 5, 0)$; foci: $(\pm 2, 0)$

9. Find the center and vertices of the hyperbola and sketch its graph, using asymptotes as sketching aids.

$$\frac{y^2}{49} - \frac{x^2}{196} = 1$$

10. Find the standard form of the equation of the hyperbola with the given characteristics and center at the origin.

Vertices: $(0, \pm 2)$; foci: $(0, \pm 6)$

11. Write the equation of the circle in standard form, and then identify its center and radius.

$$4x^2 + 4y^2 + 12x - 24y + 41 = 0$$

12. Find the vertex of the parabola, and sketch its graph. (Optional, for bonus points: find the focus and directrix.)

$$y^2 + 6y + 8x + 25 = 0$$

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

$$9x^2 + 25y^2 - 36x - 50y + 52 = 0$$

14. Find the center and vertices of the hyperbola, and sketch its graph, using the asymptotes as an aid. (Optional, for bonus points: find the foci.)

$$9x^2 - y^2 - 36x - 6y + 18 = 0$$

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

$$\begin{aligned} 5x + 6y &= 24 \\ 3x + 5y &= 18 \end{aligned}$$

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

$$\begin{aligned} \frac{9}{5}x + \frac{6}{5}y &= 4 \\ 9x + 6y &= 3 \end{aligned}$$

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

$$\begin{aligned} -5x + 6y &= -3 \\ 20x - 24y &= 12 \end{aligned}$$

18. Perform the pivot on the entry marked with an asterisk (*).

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

19. Perform the pivot on the entry marked with an asterisk (*).

$$\left[\begin{array}{cccc} 4 & 5 & 2 & -3 \\ -3 & 7 & 3 & -5 \\ -2 & 4 & -1* & 5 \\ 1 & -5 & -2 & 10 \end{array} \right]$$

20. Use Gauss-Jordan elimination (pivoting) to solve the given system of equations.

$$\begin{aligned} x + 3y - 2z &= 4 \\ 5x + 16y - 5z &= 27 \\ 4x + 13y - 6z &= 26 \end{aligned}$$