Graphing – Problems

1. (a) Which of the following equations can be graphed:

\[ x^2 + y^2 = -4, x + y = -4, x^2 + xy = 1. \]

(b) Which of the following functions have graphs that intersect the x-axis:

\[ y = -2(x + 1)^2 - 10, y = \frac{-3}{x - 1}, y = |x + 7| - 3 \]

(c) Which of the following functions have graphs that intersect the y-axis:

\[ y = -2(x + 1)^2 - 10, y = \frac{-3}{x - 1}, y = |x + 7| - 3 \]

(d) At how many distinct points do the circle given by equation \( x^2 + y^2 = 5 \) and the line with equation \( y = 2x + 3 \) intersect?

2. Find the center and radius of the following circles:

\[ x^2 + y^2 = 25, (x - 1)^2 + (y + 2)^2 = 7, 3x^2 - 12x - 18y + 3y^2 = 0 \]

3. Find the vertex, roots, and graph each of the following:

(a) \( y = 3(x - 1)^2 + 9 \)
(b) \( y = x^2 + 2x - 48 \)
(c) \( y = x(x - 10) \)
(d) \( y = x^2 - 2x - 35 \)
(e) \( y = 3x^2 + 6x - 22 \)
(f) \( y = -x^2 + 12x + 1 \)
(g) \( y = (x + 3)^2 \)

4. Graph the following functions:

(a) \( y = 2\sqrt{x} \)
(b) \( y = 2^{-x} \)
(c) \( y = \frac{1}{x - 2} \)

(d) \( y = x^3 + 2 \)

5. The graph of \( y = f(x) \) can be obtained from the graph of \( y = g(x) \) by shifting, stretching and/or reflecting. Describe the specific transformation required to turn the graph of \( y = g(x) \) into the graph of \( y = f(x) \) for each pair of functions.

(a) \( f(x) = 5(7)^{3-x} + 8, \quad g(x) = 7^x \)

(b) \( f(x) = \frac{2}{x+3} + 4, \quad g(x) = \frac{1}{2} \)

(c) \( f(x) = 5(x - 4)^2, \quad g(x) = x^2 \)

(d) \( f(x) = -\sqrt{-2x}, \quad g(x) = \sqrt{x} \)

6. Identify the graphs of the following equations as parabolas, circles, ellipses, hyperbolas, or none of the above. For parabolas, find the vertex; for circles, find the center and radius; for ellipses find the length of the major and minor axis; and for hyperbolas, find the equation of the asymptotes.

(a) \( y + x^2 = 1 \)

(b) \( 2y^2 + x^2 = 1 \)

(c) \( y^2 - x^2 = 1 \)

(d) \( y^2 - x^2 = -1 \)

(e) \( 2y^2 + x^2 = -1 \)

(f) \( (x - 3)^2 = 5 - (y - 2)^2 \)

(g) \( \frac{x^2}{5} + \frac{y^2}{16} = 1 \)

(h) \( x^2 + 2x + y^2 - 4y = 10 \)

(i) \( 9x^2 + 4y^2 = 36 \)

(j) \( 9x^2 - 16y^2 = 144 \)