College Algebra: Review (Test 3)

1. Fill in the boxes to describe the long-term behavior of the following polynomial.

$$p(x) = 3x^3 - 2x + 1$$

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- As $x \to \infty$, $p(x) \to$ ☐

- As $x \to -\infty$, $p(x) \to$ ☐

2. The polynomial
$$p(x) = x^5 - 3x^4 - 15x^3 + 35x^2 + 54x - 72$$

has roots at $4; -3; 3; -2$. Completely factor $p(x)$ as a product of linear factors.

3. Construct a polynomial of degree 3 which has roots at -2, 1, and -1.

4. The polynomial
$$p(x) = x^4 - x^3 - 7x^2 + 5x + 10$$
has a root at $\sqrt{5}$. Completely factor $p(x)$ as a product of linear factors.

5. Complete the square to find the standard form of the folloing parabola.
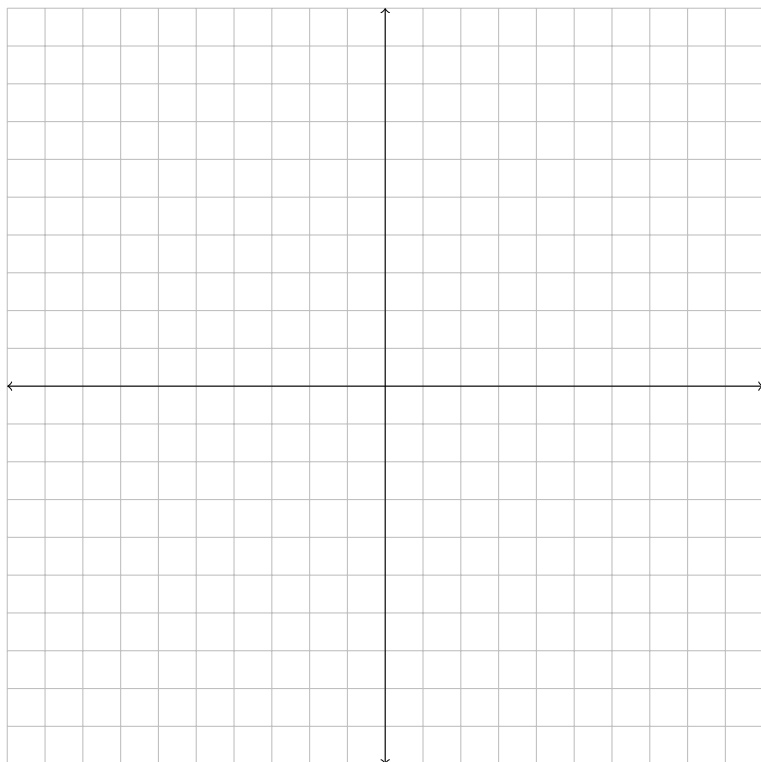$$y = x^2 + 10x + 22$$

6. Find an equation for the parabola with horizontal directrix having vertex $(-3, -2)$ and focal length -2.

7. Find the domain of the following rational function.

$$f(x) = \frac{x^2 - 4}{x^3 + x^2 - 4x - 4}$$

8. Plot the following ellipse in the space provided.

$$\left(\frac{x-4}{5}\right)^2 + \left(\frac{y+4}{2}\right)^2 = 1$$

9. Find the long-term behavior asymptote of the following rational function.

$$f(x) = \frac{x^3 + 2x^2 - 9x - 18}{x + 5}$$

10. Plot the following parabola in the space provided.

$$y = \frac{1}{4}(x+5)^2 - 2$$