Math 161 Test 3 Name_____

1. Find the vertex and zeros of the quadratic function $f(x) = x^2 + 6x + 7$

Vertex: (____ , ____) Zeros: _____ , _____

2. Find the vertex of the quadratic function $f(x) = x^2 + 4x + 1$

Vertex: (____ , ____)

3. What is the minimum value of the function in problem 2? _____

4. Does the function in problem 2 have any real zeros? _____. Why or why not._____

5. Find the quadratic function with vertex (-2, 3) that passes through the point (0,11)

6. Use synthetic division to divide: $(x^4 + 6x^3 - 10x + 12) \div (x + 2)$

7. For $f(x) = x^4 + 6x^3 - 10x + 12$ what is $f(-2)$?

8. List all possible <u>rational</u> roots for the function
$f(x) = 2x^4 - x^3 - 9x^2 + 3x + 9$

9. For the function above, check that $f(-1) = 0$, and then factor *f* into a linear factor and a cubic polynomial.

10. How many roots do cubic polynomials with real coefficients have? _____ Must they all be real? _____

11. One root of the function in problem 9 is $\sqrt{3}$. What must another root be?_____

12. We now know three roots for $f(x) = 2x^4 - x^3 - 9x^2 + 3x + 9$. How many are there total?_____

13. Find the other root, and factor the polynomial into linear factors.

14. Find the vertical and horizontal asymptotes for the rational function

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

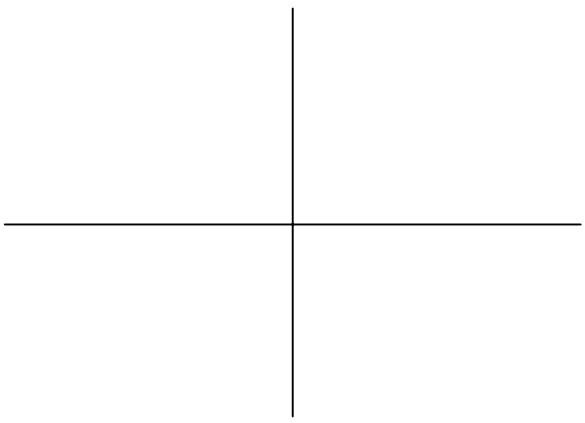
15. Give an example of a rational function with horizontal asymptote $y = 0$, and a vertical asymptote at $x = 4$.

16. Write the partial fraction decomposition for the rational expression

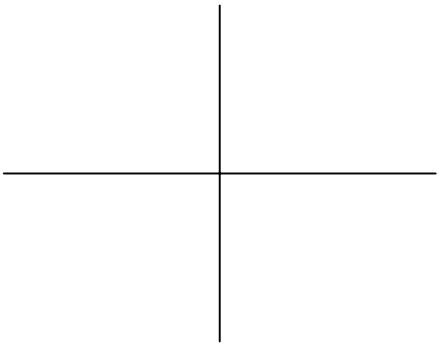
$$\frac{3x - 4}{(x - 3)(x + 2)}$$

Graph the following:

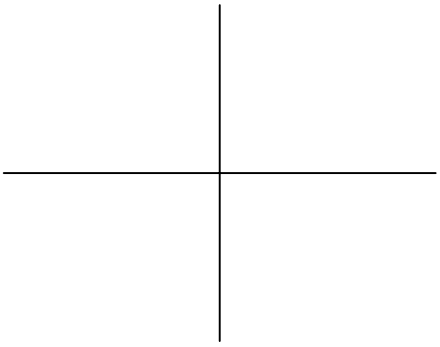
17. A quadratic polynomial with negative leading coefficient.



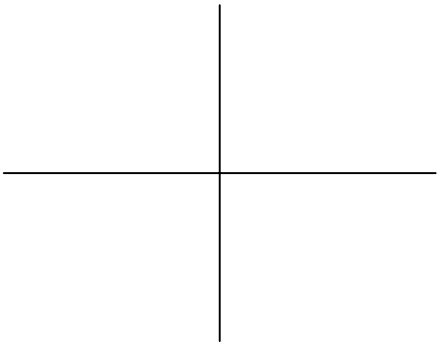
18. Any cubic polynomial with positive leading coefficient and three real zeros.



19. A fourth degree polynomial with positive leading coefficient and 4 real zeros.



20. A rational function with horizontal asymptote $y = 0$ and vertical asymptote $x = 3$.



21. A cubic polynomial with 2 real zeros.