

## Chapter 3 - Polynomials and Rational Functions

**CALCULATOR INACTIVE.**

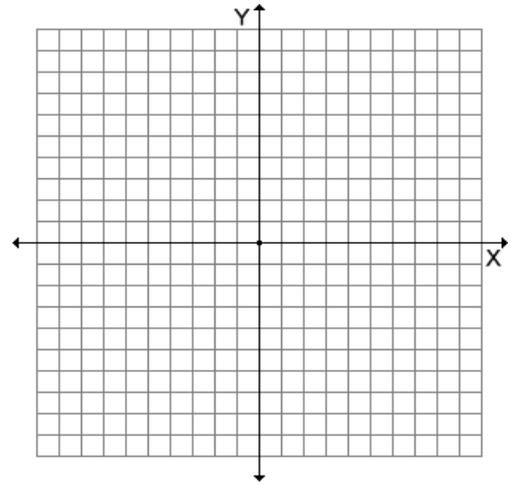
1. Graph the quadratic function by hand:  $f(x) = x^2 + 2x - 3$

aos:

vertex:

y – intercept:

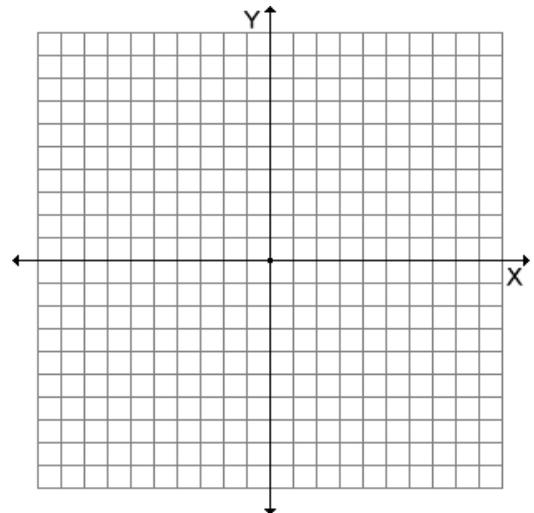
x – intercept(s):



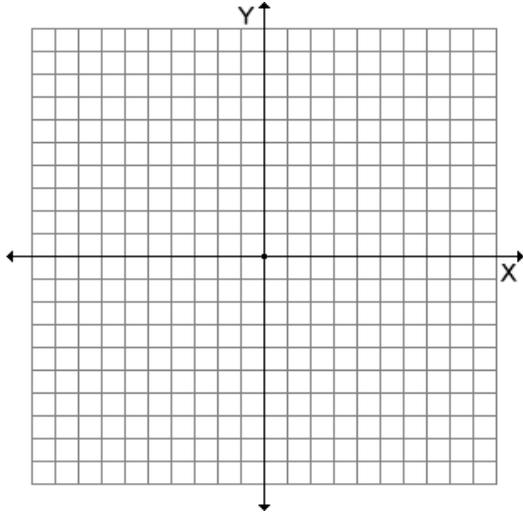
2. A farmer has 550 ft of fencing material to make a rectangular pen. However, he will subdivide the pen into two sections (not necessarily equal). What **dimensions** of the pen would maximize its area?

3. Write an equation for the quadratic function whose vertex is (2, 3) and passes through (-1, -1).

4. Sketch the graph of the function  $y = -0.5(x + 1)^4 - 3$ . Label three points on the graph



5. For the polynomial function, list each real zero and its multiplicity then graph the function.

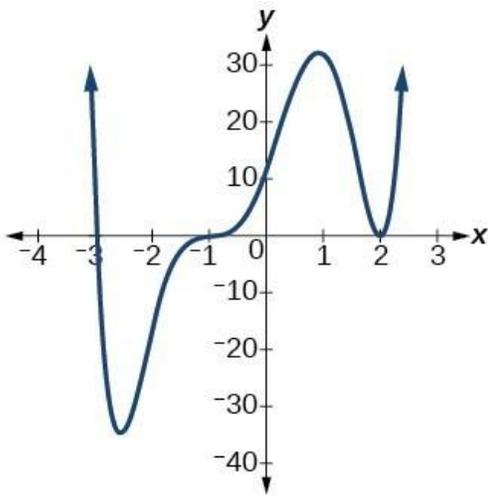


$$f(x) = 2x(3 - x)(2x + 4)^3$$

Zeros: \_\_\_\_\_

Multiplicities: \_\_\_\_\_

6. Give a polynomial function for the graph below. How many turning points does this graph contain?



$f(x) =$   
\_\_\_\_\_

# of turning points: \_\_\_\_\_

Multiplicities \_\_\_\_\_

7. Analyze the function below and sketch its graph.

$$R(x) = \frac{x^2 - 8x + 12}{x^2 - 4}$$

Domain:

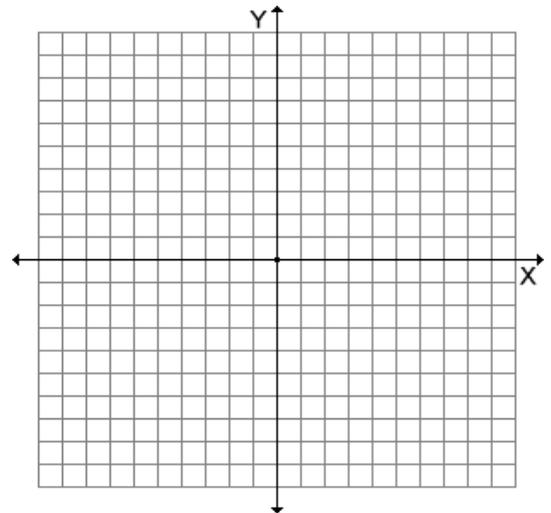
X-int:

y-int:

Symmetry:

V.A.:

H.A., O.A., or other:



8. Find the horizontal or oblique asymptotes, if any, of each rational function.

a.  $f(x) = \frac{-x + 1}{x^2 + 5}$

b.  $H(x) = \frac{x^3 + 2x^2 + 1}{x^2 - 4}$

9. Is  $(x - 3)$  a factor of  $f(x) = x^3 - x^2 - x - 15$ ? Why or why not?

10. Find all of the zeros of  $f(x) = x^3 - 3x^2 - 6x + 8$ .

11. **List** all of the potential rational zeros of  $f$  if  $f(x) = 3x^3 + 11x^2 - 12x + 8$ .

12. A sixth degree polynomial has zeros  $i$ ,  $2 - 3i$ , and  $4 + 2i$ . Give the remaining zeros.

13. Find all the zeros of  $f(x) = 3x^4 - 4x^3 + 4x^2 - 4x + 1$ .

14. Solve the inequality  $x^3 + 9x^2 + 20x \leq 0$ .

15. Solve the inequality  $\frac{3x - 4}{2x + 4} \geq 1$ .

**CALCULATOR ACTIVE.**

16. The manufacturer of a CD player has found that the revenue  $R$  (in dollars) is  $R = -2p^2 + 1600p$ , when the unit price is  $p$  dollars. What unit price  $p$  should be established to maximize revenue?

17. The height  $h$  of a projectile above the water is given by  $h(x) = \frac{-32x^2}{(400)^2} + x + 300$  where  $x$  is the horizontal distance of the projectile from the base of the cliff.

a. What is the maximum height of the projectile?

b. At what horizontal distance(s) will the projectile be 500 feet above the water?

c. How far from the base of the cliff will the projectile strike the water?

18. Consider the following table and answer the questions below.

Number of Text Books, $x$ (in thousands)	Cost, $c$ (in thousands)
0	100
5	128.1
10	144
13	153.5
17	161.2
18	162.6
20	166.3
23	178.9
25	190.2
27	221.8

a. Find the **cubic function** of best fit.

b. Use the function to predict the cost of printing 22 thousand texts per week.

**Extra Credit**

A. Find  $k$  such that  $f(x) = x^4 - kx^3 + kx^2 + 1$  has the factor  $x + 2$ .

B. Solve algebraically.

$$\frac{2x + 5}{x + 1} > \frac{x + 1}{x - 1}$$

C. Make up a rational function that crosses the  $x$ -axis at 3; touches the  $x$ -axis at -2; has one VA at  $x = 1$ ; and has one HA at  $y = 2$ .