

**Directions:** To receive partial credit you must show your work on a problem.

Circle final answers. All problems are 5 points each.

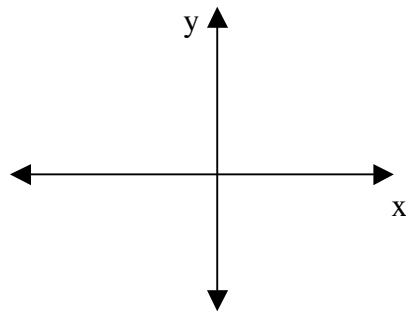
For the quadratic function  $y = -2x^2 - 12x - 16$  find the following.

1. Vertex = \_\_\_\_\_

2. x and y intercepts  
x-int = \_\_\_\_\_ y-int = \_\_\_\_\_

For the quadratic function  $y = -2x^2 - 12x - 16$  find the following.

3. Graph



4. Domain and Range

D = \_\_\_\_\_ R = \_\_\_\_\_

Divide the following polynomials.

5.  $(2x^2 + 10x + 12) \div (x + 3)$

Divide the following polynomials.

6.  $(4x^3 - 7x^2 - 11x + 5) \div (4x + 5)$

Divide the following polynomials.

7.  $(5x^3 - 6x^2 + 8) \div (x - 4)$

Divide the following polynomials.

8.  $(7x + 3) \div (x + 2)$

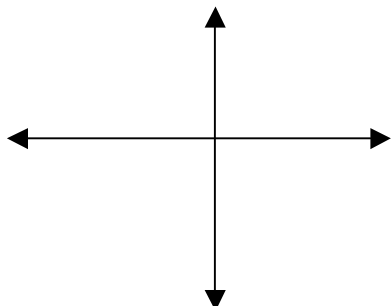
Use synthetic division and the factor theorem to determine whether the second polynomial is a factor of the first. State **YES** or **NO**

9.  $f(x) = x^4 - 25x^2 + 144; \quad x + 3$

Describe the transformation that occurs in the function. Remember to find the basic function first. Also sketch the graph.

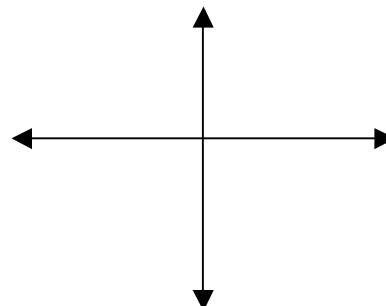
10.  $f(x) = -x^4 + 4$

Description: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



11.  $f(x) = (x - 2)^3 - 2$

Description: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

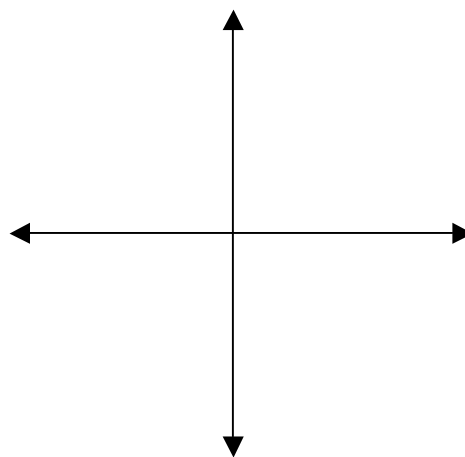


Graph the polynomial function. **SHOW ALL** the steps we discussed in class.

$$y = (x + 2)(x - 1)(x - 2)(x + 2)$$

12. Find the x and y intercepts.
13. Find the test point information for the x-intercepts.

14. Use the previous work(#12 and #13) to graph the polynomial.



Find the zeros of the polynomial and state the multiplicity of each.

15.  $P(x) = x^2(x^2 - 4)(x + 3)^2$

Use the Rational Zero Theorem to list possible rational zeros for the polynomial.

16.  $P(x) = 2x^3 + x^2 - 25x + 12$

Use the Rational Zero Theorem to list possible rational zeros for the polynomial.

17.  $P(x) = x^5 - 32$

Factor each polynomial into linear factors and/or quadratic factors that are irreducible over the reals.

18.  $P(x) = x^3 - x^2 - 2x$

Find the zeros of the polynomial.

19.  $P(x) = 2x^4 - 17x^3 + 4x^2 + 35x - 24$

Find the zeros of the polynomial.

**Hint:** Find the rational zeros first.

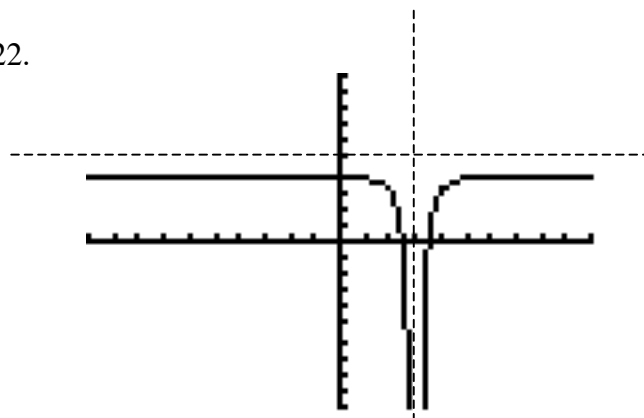
20.  $P(x) = x^4 + x^3 - 2x^2 + 4x - 24$

Find the zeros of the polynomial.

21.  $P(x) = 6x^4 + 23x^3 + 19x^2 - 8x - 4$

Use stretching/shrinking, reflecting and shifting rules to give an equation of the following graphs.

22.



Give the equations of the vertical, horizontal and/or slant asymptotes of the rational functions.

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

24.  $f(x) = \frac{2(3x - 1)(x + 4)}{(x + 2)(5x - 3)}$

V.A. \_\_\_\_\_ H.A. \_\_\_\_\_ S.A. \_\_\_\_\_

V.A. \_\_\_\_\_ H.A. \_\_\_\_\_ S.A. \_\_\_\_\_

Find the x-intercepts and y-intercept of the rational function.

25.  $f(x) = \frac{3x}{(x + 1)(x - 2)}$

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

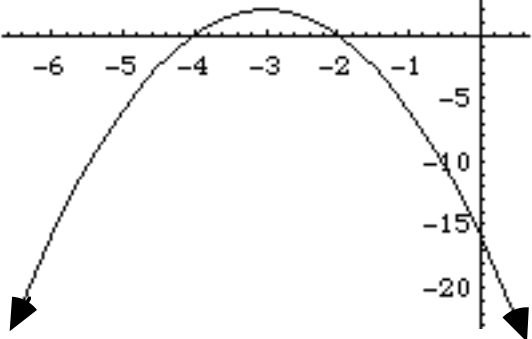
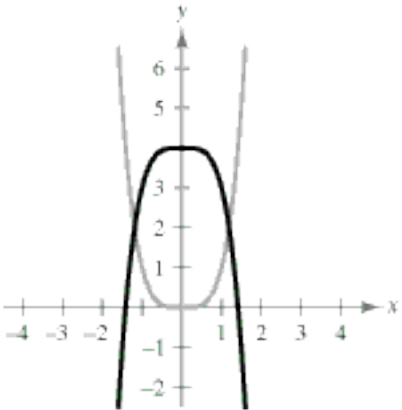
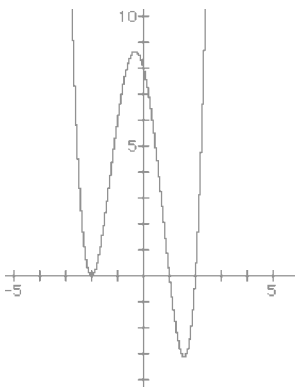
x-int \_\_\_\_\_ y-int \_\_\_\_\_

x-int \_\_\_\_\_ y-int \_\_\_\_\_

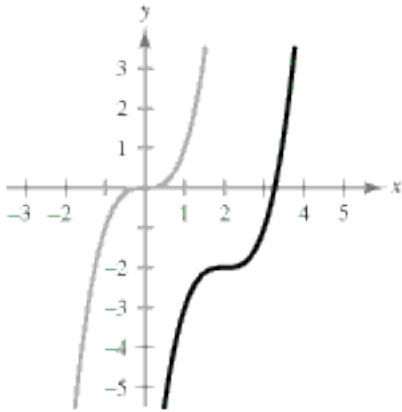
Sketch the graph and provide information about intercepts and asymptotes.

27.  $f(x) = \frac{x}{x^2 - x - 2}$

## Answers Sample Test 3

1. vertex: $(-3, 2)$	2. x - int.: $(-4, 0), (-2, 0)$ y - int.: $(0, -16)$
3. 	4. Domain = $(-\infty, \infty)$ Range = $(-\infty, 2]$
5) $2x + 4$ 6) $x^2 - 3x + 1$ 7) $5x^2 + 14x + 56 + \frac{232}{x - 4}$ 8) $7 - \frac{11}{x + 2}$ 9) Yes! Remainder is zero!	12) x-int: $x = -2, x = 1, x = 2, x = -2$ y-int: $y = 8$ 13) Answers may vary. $x = -3, y = 20$ <u>above x-axis</u> $x = 0, y = 8$ <u>above x-axis</u> $x = 1.5, y = -3.06$ <u>below x-axis</u> $x = 3, y = 50$ <u>above x-axis</u>
10.  Reflection in the x-axis and then a vertical shift four units upward.	14)  15) 0 is a zero of multiplicity two 2 is a zero of multiplicity one -2 is a zero of multiplicity one -3 is a zero of multiplicity two

11.



Horizontal shift two units to the right and a vertical shift two units downward.

16)  $\frac{p}{q} = \pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12, \pm \frac{1}{2}, \pm \frac{3}{2}$

17)  $\frac{p}{q} = \pm 1, \pm 2, \pm 4, \pm 8, \pm 16, \pm 32$

18) factors are:  $x(x-2)(x+1)$

19) zeros are:  $x = 8, x = 1, x = 1, x = \frac{-3}{2}$

20) zeros are:  $x = -3, x = 2, x = +2i, x = -2i$

21) zeros are:  $x = \frac{1}{2}, x = -2, x = -2, x = \frac{-1}{3}$

22)  $\frac{-1}{(x-3)^2} + 5$

23) V.A.  $x = 4$  H.A. None S.A.  $y = 2x + 8$

24) V.A.  $x = -2$  &  $x = \frac{3}{5}$  H.A.  $y = \frac{6}{5}$   
S.A. None

25) x-int  $x = 0$ , y-int  $y = 0$

26) x-int  $x = 5$  &  $x = 2$ , y-int  $y = \frac{10}{9}$

27) see attached sheet. (next page)

Example Sketch the graph and provide information about intercepts and asymptotes.

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

1. Find and plot the x-intercepts. (Set numerator = 0 and solve for x)

$$x = 0$$

---

2. Find and plot the y-intercepts. (Let x = 0 and solve for y)

$$f(0) = \frac{0}{0^2 - 0 - 2} = 0$$

---

3. Find and plot the Vertical Asymptotes. (Set denominator = 0 and solve for x)

$$\begin{aligned}x^2 - x - 2 &= 0 \\(x + 1)(x - 2) &= 0 \\x &= -1 \text{ and } x = 2\end{aligned}$$

---

4. Find and plot the Horizontal Asymptotes. (Top heavy, Bottom heavy or Same)

(Rule 1)  $y = 0$

---

5. Find and plot the Slant Asymptotes. (Divide numerator by denominator.)

None

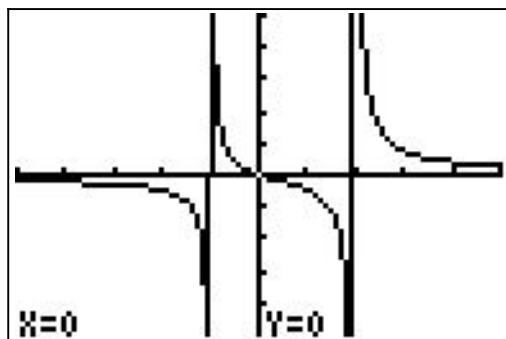
---

6. Plot at least one point between and beyond each x-intercept and vertical asymptotes.

choose:

x = -2	x = -.5	x = 1	x = 3
y = -.5	y = .4	y = -.5	y = .75

Note: YOU MAY WANT TO PICK MORE POINTS TO GET A BETTER GRAPH !



ANSWER: