

Review -Chapter 3

1) Factor completely $x^3 + 7x^2 - 4x - 28$

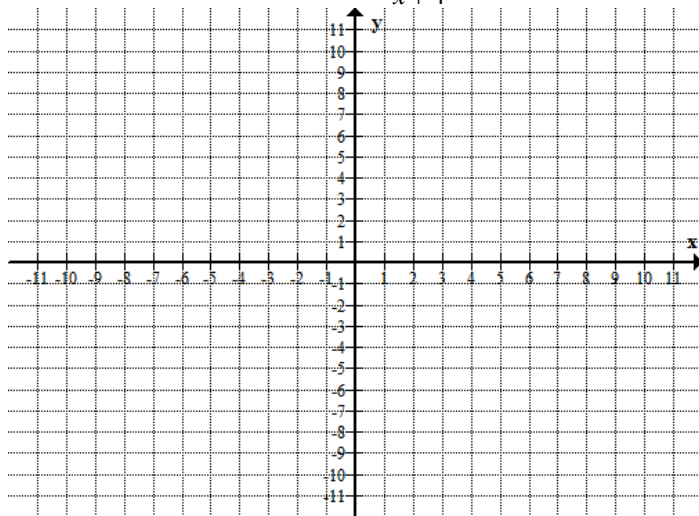
2) Analyze the graph of the function $f(x) = -x^2(x - 1)(x + 3)$ as follows

- Determine the end behavior: Find the power function that the graph of f resembles for large values of x .
- Find the x -intercepts
- Determine whether the graph crosses or touches the x -axis at each x -intercept
- Use the information in a)-c) to sketch the graph of f .

3) Find the leading term of $f(x) = -x^2(x+2)^2(x^2-1)$.

4) Factor completely $64x^3 - 1$

5) Graph the function $f(x) = 6 - \frac{1}{x+4}$ using transformations.



Give the equation of the horizontal asymptote, if any, of the function.

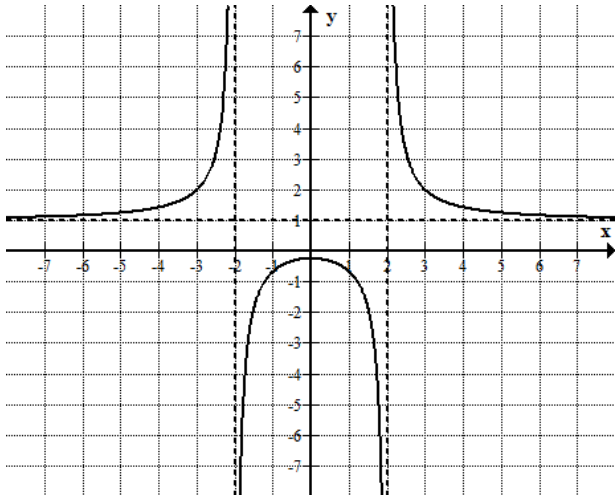
6)
$$h(x) = \frac{6x^3 - 6x - 9}{2x + 9}$$

7)
$$f(x) = \frac{x(x-1)}{x^3 + 25x}$$

8)
$$h(x) = \frac{8x^2 - 2x - 4}{6x^2 - 3x + 6}$$

9) Divide using synthetic division $(x^5 + x^3 - 5) \div (x-2)$

10) Use the graph to find the horizontal and vertical asymptotes, if any, of the function. Then use the graph to complete each statement



- a) As $x \rightarrow -2^-$, then $f(x) \rightarrow$ _____
- b) As $x \rightarrow -2^+$, then $f(x) \rightarrow$ _____
- c) As $x \rightarrow 2^-$, then $f(x) \rightarrow$ _____
- d) As $x \rightarrow -\infty$, then $f(x) \rightarrow$ _____

11) Divide using long division $(12x^3 + 6x^2 - 6x + 10) \div (3x^2 + 5)$

12) Solve the inequalities.

a) $\frac{x^2(x-10)(x+1)}{(x-5)(x+8)} \geq 0$

b) $\frac{(x-1)(3-x)}{(x-2)^2} \leq 0$

c) $x^4 + x^2 - 20 > 0$

d) $x(x+3)(5-x) \geq 0$

d)

13) Use synthetic division to determine whether $x + 4$ is a factor of the polynomial $3x^3 - 2x^2 - 10x + 14$

14) Factor completely $125x^3 + 27$

15) Find the domain of the given function.

$$f(x) = \frac{-2x(x+2)}{2x^2 - 7x - 9}$$

16) For the polynomial function, $f(x) = \frac{1}{3}x^4(x^2 - 3)(x + 6)$, list each real zero and its multiplicity. Determine whether the graph crosses or touches the x-axis at each x-intercept. Sketch the graph of f

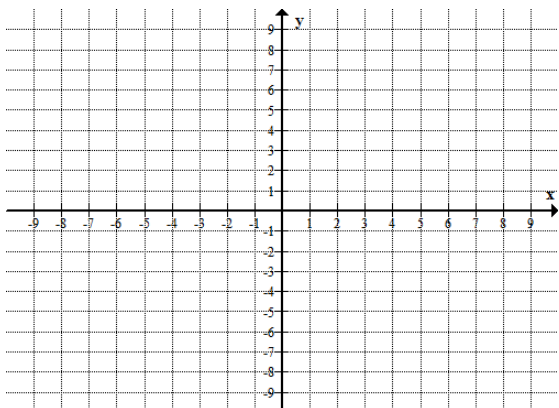
17) Factor completely $x^2 + 5x + 6$

18) Using synthetic division, determine whether the numbers 7, 3 are zeros of the polynomial

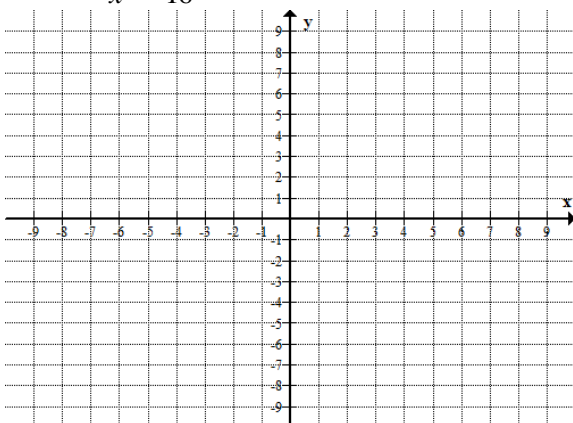
$$f(x) = x^3 - 11x^2 + 36x - 36.$$

Graph the given functions. Draw the asymptotes, if any.

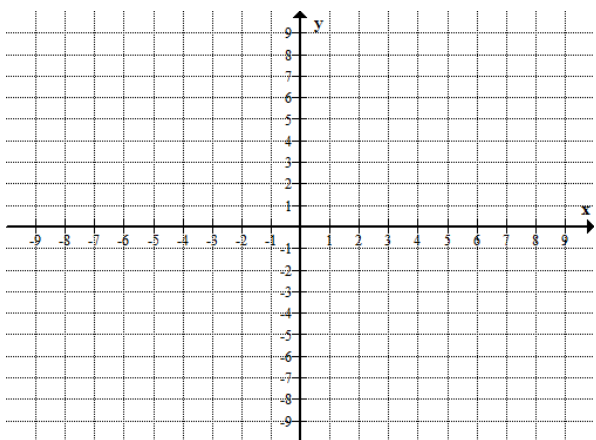
19)
$$f(x) = \frac{x^2 + 6x + 8}{x^2 - 4}$$



20)
$$f(x) = \frac{x}{x^2 - 16}$$

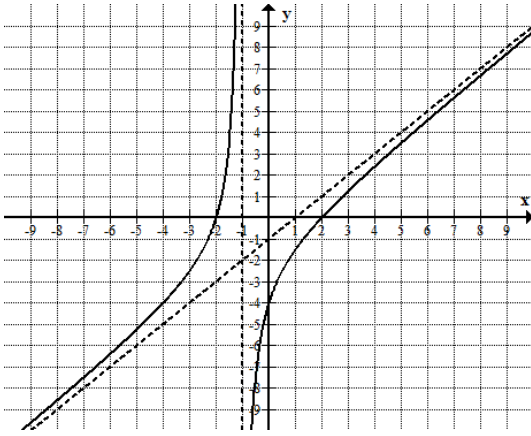


21)
$$f(x) = \frac{x^2 - 2x - 3}{(x - 5)^2}$$



22) Find the vertical asymptotes of the function $f(x) = \frac{x - 6}{36x - x^3}$

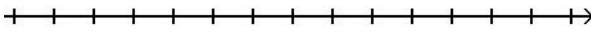
23) Use the graph to find the equation of the oblique asymptote.



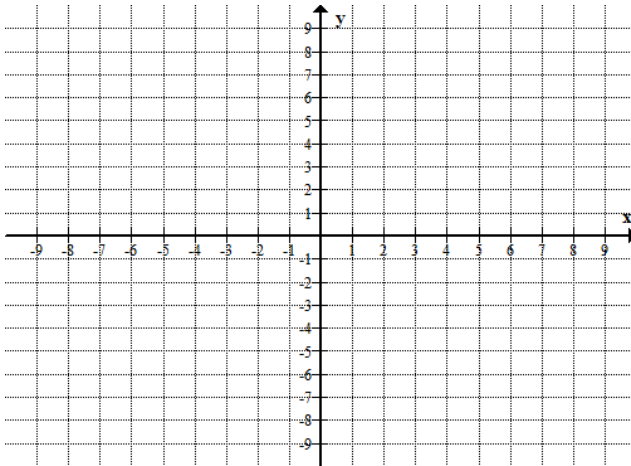
24) Find the equation of the oblique asymptote, if any, of the function $f(x) = \frac{2x^3 + 11x^2 + 5x - 1}{x^2 + 6x + 5}$

25) Solve the polynomial inequality and graph the solution set on the number line. Express the solution set in interval notation.

$$x^3 + 9x^2 - x - 9 > 0$$



26) Sketch the graph of $f(x) = \frac{x^2 + 4}{x - 1}$. Include the asymptotes, if any.



27) Find the x- and y-intercepts of $f(x) = -x^2(x+5)(x^2+3)$

28) Factor completely $15z^2 - 8z - 16$

In problems 33-34, state whether the function is a polynomial function or not. If it is, give its degree. If it is not, tell why not.

29) $f(x) = \frac{x^4 - 1}{x^2}$

30) $f(x) = -5x^5 - 2x^4 + 4x^2 + 2$

31) Find the domain of the given function.

$$f(x) = \sqrt{2 - \frac{x-3}{5+x}}$$

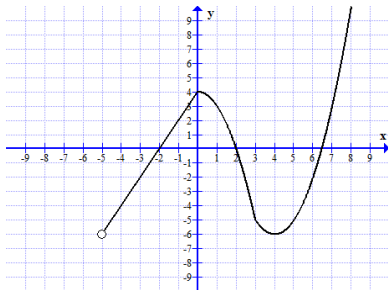
32) Factor completely $4x^2 - 81$

33) Factor completely an expression that occurs in calculus

$$2(x + 6)(x-5)^3 + 6(x+6)^2(x-5)^2$$

34) Find the degree and the leading coefficient of the polynomial function $f(x) = -5x^2(x-2)(x+1)^2(x^2 + 3)^3$

37) Determine whether the graph below could be the graph of a polynomial function. Explain why or why not.



36) Determine the end behavior of the following polynomial functions

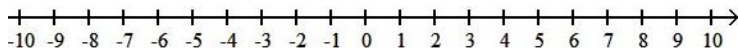
a) $f(x) = -3x^5 + 4x^4 - 7x^3 - 5x^2 + 2x - 6$

b) $f(x) = -x(x-2)^2(x + 3)^3(x^2 + 5)$

37) Graph the polynomial function $f(x) = 6x - x^3 - x^5$

38) Solve the rational inequality and graph the solution set on the real number line. Express the solution set in interval notation.

$$\frac{4x}{x + 6} < x$$



39) Solve the equation $2x^3 - 3x^2 - 11x + 6 = 0$ given that -2 is a zero of $f(x) = 2x^3 - 3x^2 - 11x + 6$

Answers

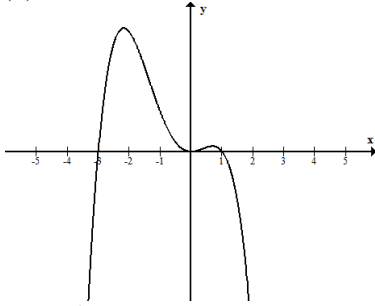
1) $(x + 7)(x + 2)(x - 2)$

2) (a) For large values of $|x|$, the graph of $f(x)$ will resemble the graph of $y = -x^4$. The graph will fall on the left and the right

(b) x-intercepts: $(-3, 0)$, $(0, 0)$, and $(1, 0)$

(c) The graph of f crosses the x-axis at $(1, 0)$ and $(-3, 0)$ and touches the x-axis at $(0, 0)$.

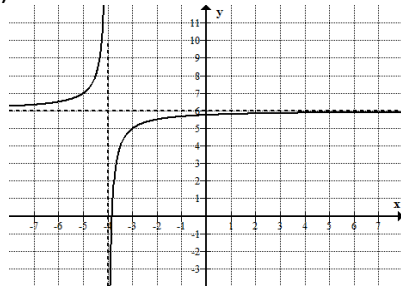
(d)



3) $-x^6$

4) $(4x - 1)(16x^2 + 4x + 1)$

5)



6) no horizontal asymptotes

7) $y = 0$

8) $y = 4/3$

9) $x^4 + 2x^3 + 5x^2 + 10x + 20 + \frac{35}{x - 2}$

10) HA: $y = 1$; VA: $x = -2, x = 2$

a) $+\infty$; b) $-\infty$; c) $-\infty$; d) 1

11) $4x + 2 - \frac{26x}{3x^2 + 5}$

12) a) $(-\infty, -8) \cup [-1, 5) \cup [10, \infty)$; b) $(-\infty, 1] \cup [3, \infty)$; c) $(-\infty, -2) \cup (2, \infty)$; d) $(-\infty, -3] \cup [0, 5]$

13) No

14) $(5x + 3)(25x^2 - 15x + 9)$

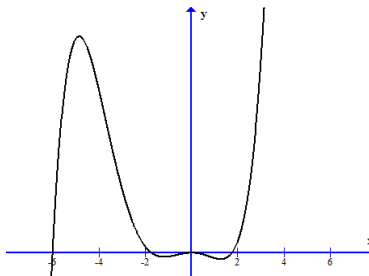
15) $\left\{ x \mid x \neq \frac{9}{2}, -1 \right\}$

16) 0, multiplicity 4, touches x-axis;

-6, multiplicity 1, crosses x-axis;

$\sqrt{3}$, multiplicity 1, crosses x-axis;

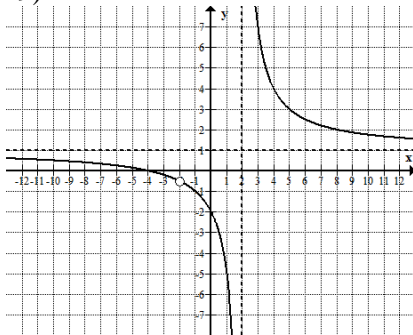
$-\sqrt{3}$, multiplicity 1, crosses x-axis



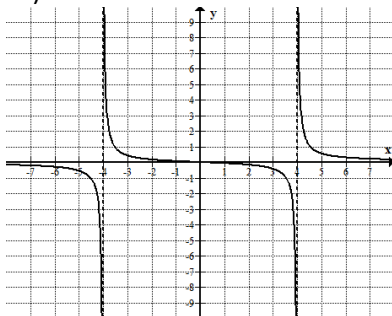
17) $(x + 2)(x + 3)$

18) No; yes

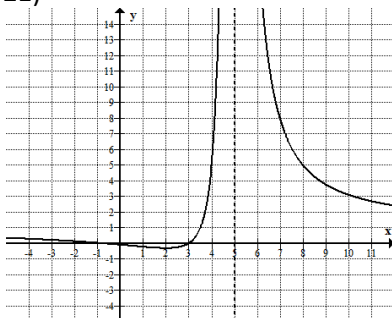
19)



20)



21)



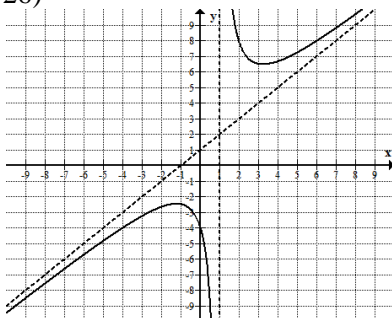
22) $x = 0, x = -6$

23) $y = x - 1$

24) $y = 2x - 1$

25) $(-9, -1) \cup (1, \infty)$

26)



27) x-intercepts: $-5, 0$; y-intercept: 0

28) $(3z - 4)(5z + 4)$

29) No; it is a ratio of polynomials

30) Yes; degree 5

31) $(-\infty, -13] \cup (-5, \infty)$

32) $(2x + 9)(2x - 9)$

33) $2(x + 6)(x-5)^2(4x + 13)$

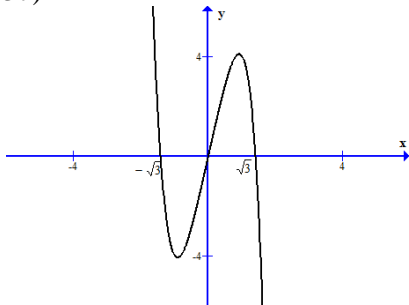
34) degree = 11; leading coefficient = -5

35) no

36) a) behaves like $y = -3x^5$; rises to the left and falls to the right;

b) behaves like $y = -x^8$; falls to the left and falls to the right.

37)



38) $(-6, -2) \cup (0, \infty)$

39) $\{-2, 3, \frac{1}{2}\}$