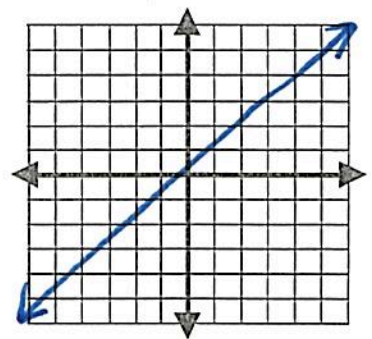
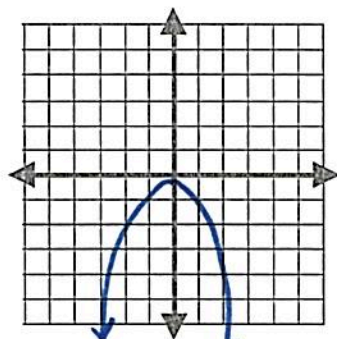


1. Graph each parent function. State the domain and range for each.



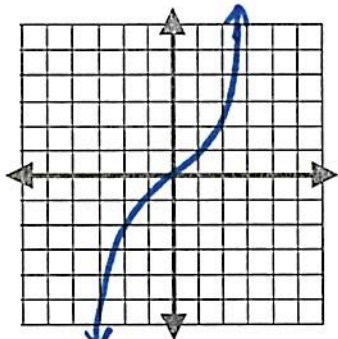
A) Linear: $f(x) = x$

Domain: \mathbb{R} Range: \mathbb{R}



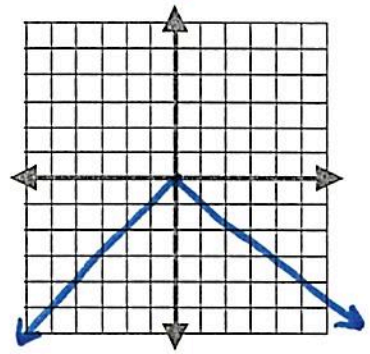
B) Quadratic: $f(x) = x^2$

Domain: \mathbb{R} Range: $y \geq 0$



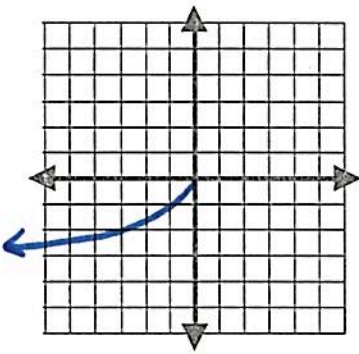
C) Cubic: $f(x) = x^3$

Domain: \mathbb{R} Range: \mathbb{R}



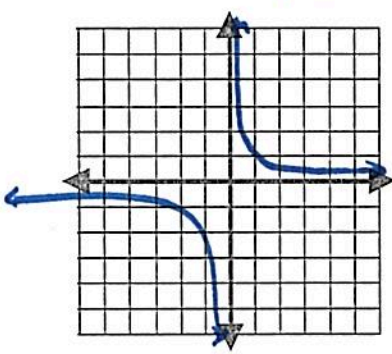
D) Absolute value: $f(x) = |x|$

Domain: \mathbb{R} Range: $y \geq 0$



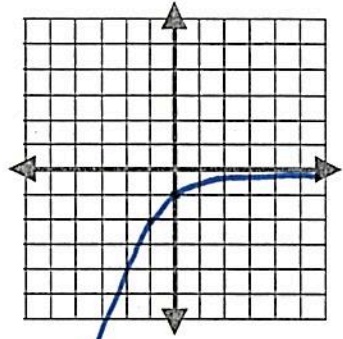
E) Square Root: $f(x) = \sqrt{x}$

Domain: $x \geq 0$ Range: $y \geq 0$



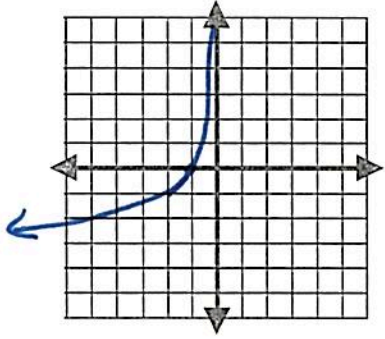
F) Rational: $f(x) = \frac{1}{x}$

Domain: $x \neq 0$ Range: $y \neq 0$



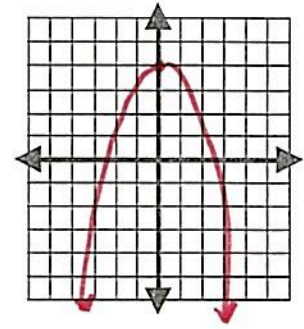
G) Exponential: $f(x) = 2^x$

Domain: \mathbb{R} Range: $y > 0$



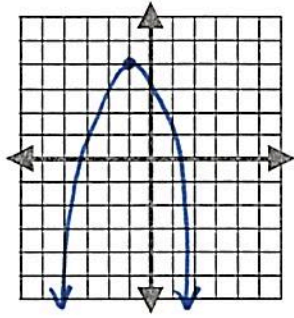
H) Logarithmic: $f(x) = \log_2 x$

Domain: $x > 0$ Range: \mathbb{R}



a) $f(x) = x^2 - 4$

4. Graph (show at least 3 points). (Ch.5)

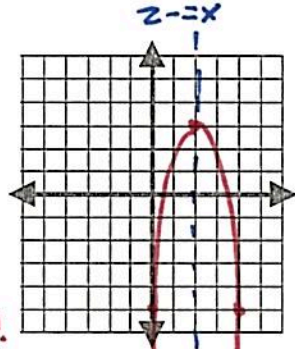


b) $f(x) = x^2 - 2x - 3$

$(x^2 - 2x + 1) - 3 - 1$
 $(x-1)^2 - 4$

Axis of symmetry: $x = 3$

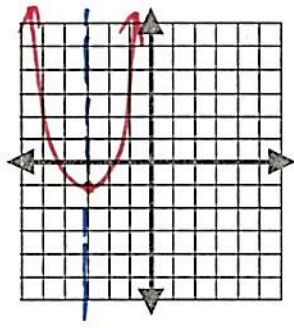
Axis of symmetry: $x = -2$



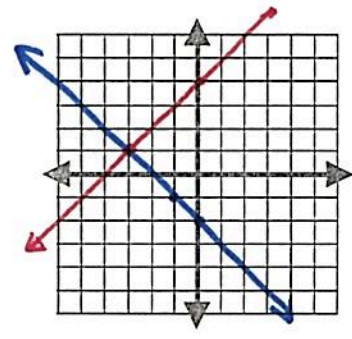
a) $y = 2(x+2)^2 - 3$

plug in x=0

3. Graph (show at least 5 points). Give the axis of symmetry. (Ch.5)

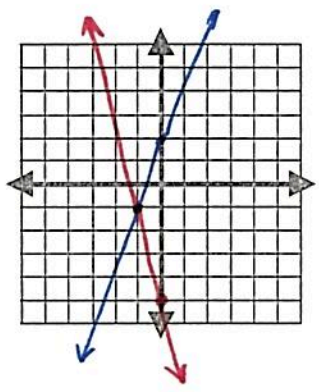


b) $y = -(x-3)^2 + 1$



a) $\begin{cases} x + y = 2 \\ x - y = 4 \end{cases}$
 $(3, -1)$
 $y = x - 4$
 $y = -x + 2$

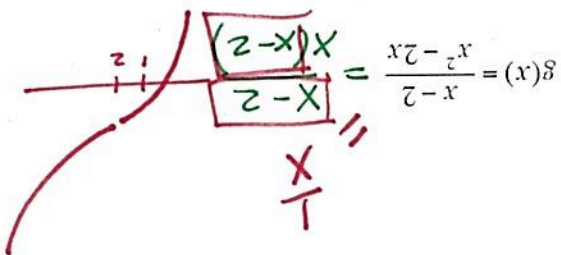
2. Solve the following systems by graphing:



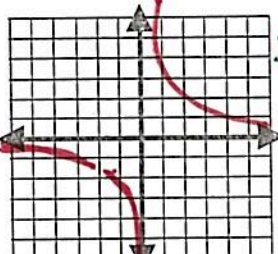
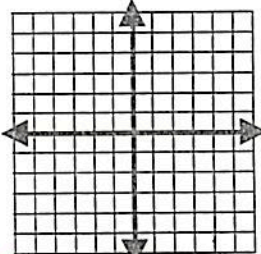
b) $\begin{cases} y = 3x - 2 \\ 5x + y = 6 \end{cases}$
 $(1, 1)$
 $y = -5x + 6$

5. Graph $g(x)$, show at least 4 points. (Ch.8)

a) $g(x) = \frac{|x-2|}{|x+2|}$



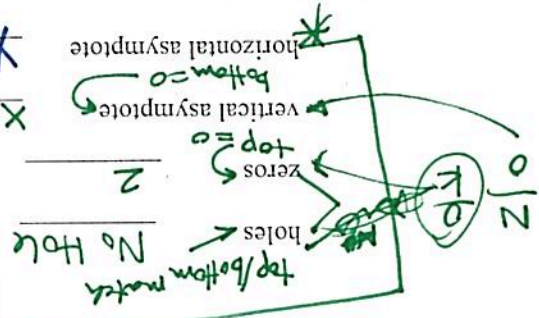
* Degree
 $N > D \Rightarrow \text{No H}$
 $N < D \Rightarrow Y=0$
 $N = D \Rightarrow \text{r.c.D}$



$\frac{1}{x} = \frac{x(x-2)}{x-2}$

$3x^2 + 2$
 $y = 7x^2 - 4$
 $H_{\text{on}} = y = \frac{7}{3}$

holes $x=2$
 zeros None
 vertical asymptote $x=0$
 horizontal asymptote $y=0$



Chapter 1-4

6. For each parent function give the equation of the transformed function :

- a) $f(x) = x^3$ is translated down 2 units and left 4 units. $f(x) = (x+4)^3 - 2$
- b) $f(x) = \frac{1}{x}$ is translated 3 units up and right 5 units. $f(x) = \frac{1}{x-5} + 3$
- c) $f(x) = \log x$ is reflected over the x-axis. $f(x) = -\log x$
- d) $f(x) = 2^x$ is reflected over the y-axis. $f(x) = 2^{-x}$



7. A water balloon is shot into the air with a home made sling shot, it reaches a height of 20 feet, and then falls to the ground, describe the path of the balloon. Which parent function's graph would best represent the path of the balloon?

Parabola $y = -x^2$

8. Solve the following system using substitution or elimination. Show all work for full credit.

substitution

$$y - 3\left(\frac{2}{3}y + 3\right) = 5$$

$$y - 2y + 9 = 5$$

$$-y + 9 = 5$$

$$-y = -4$$

$$y = 4$$

a)

$$y - 3x = 5$$

$$\frac{2}{3}x = \frac{2}{3}y + 6$$

$$2x = 2y + 18$$

$$2x = 2(3x - 4) + 18$$

$$2x = 6x - 8 + 18$$

$$2x = 6x + 10$$

$$-4x = 10$$

$$x = -\frac{5}{2}$$

$$\frac{13}{-4+6i}$$

$$\frac{2i(3+2i)}{2i(3+2i)} = \frac{6i+4(2)}{9-6i+6i-4} = \frac{6i+8}{5}$$

$$7+11i$$

a) $(12+4i) - (5-7i)$

19. Simplify each:

a) $3-2i$ $3+2i$

18. What is the conjugate of

Find $h(-5) = \frac{(-5)^2 + 3(-5) + 1}{11} = \frac{25-15+1}{11} = \frac{11}{11} = 1$

17. a) If $h(x) = x^2 + 3x - 1$

Axis of symmetry:

b) If $g(x) = -5x^3 - x^2 + 1$

y-intercept:

calculator

a) $f(x) = 2x^2 + 8x - 3$

16. Identify the minimum or maximum of:

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

b) $g(x) = -(x+4)^2 - 8$

15. What is the vertex of:

$$y = 2(x+4)^2 - 37$$

$$2(x^2 + 8x + 16) - 37 = 2x^2 + 16x - 5$$

b) Write the equation of the parabola $f(x) = 2x^2 + 16x - 5$ in standard vertex form.

$$y = (x+2)^2 - 21$$

14. a) Write the equation of the parabola $f(x) = x^2 - 4x - 17$ in standard vertex form.

$$\left(\frac{-4}{2}\right)^2 = 4 \quad x^2 - 4x + 4 - 17 - 4$$

$$4 + 17 = x^2 - 4x + 4$$

$$21 = (x-2)^2$$

$$y = (x-2)^2 + 4$$

in standard vertex form.

in standard vertex form.

calculator

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

2nd trace

find $g(2) = -43$

$$-5(2)^3 - (2)^2 + 1 = -40 - 4 + 1 = -43$$

b) $(2+3i)^2 = (2+3i)(2+3i)$

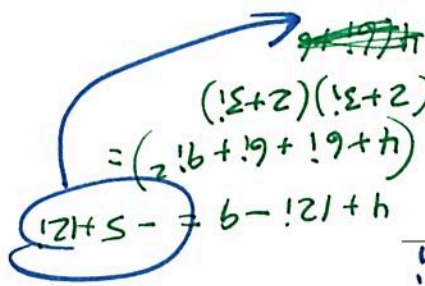
$$(4+6i+6i+9i^2) = 4+12i-9 = -5+12i$$

b) $4+6i$ $4-6i$

$10+15i-2i-3i^2$

$10+13i+3$

$13+13i$



24. Find the product

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

$$2x^3 - 6x^2 + 6x + 4x^2 - 12x + 12$$

$$2x^3 - 2x^2 - 6x + 12$$

23. Add or Subtract

a) $(5y^3 - 2y^2 - 1) + (y^2 - 2y - 3)$
 $5y^3 - y^2 - 2y - 4$

b) $(x^2 - 3x + 4) + (3x + x^3 + 4)$
 $x^3 + x^2 - 6x + 8$

$3x^2 + 4x$	$4x^3$	$4x^2$	$4x$
$-3x^2 + 6x$	$8x^3$	$-4x^2$	$-2x$
$-24x^2$	$-32x$	$+16$	-8

$(-3x^2 + 4x - 2)(2x^2 + x - 8)$

23. Add or Subtract

a) $(5y^3 - 2y^2 - 1) + (y^2 - 2y - 3)$
 $5y^3 - y^2 - 2y - 4$

b) $(x^2 - 3x + 4) + (3x + x^3 + 4)$
 $x^3 + x^2 - 6x + 8$

Chapter 6

c) $6x^2 = -x + 15$
 $6x^2 + x - 15 = 0$
 $(3x+5)(2x-3)$
 $x = -5/3, x = 3/2$

a) $2x^2 + 8x + 6 = 0$
 $(2x+2)(x+3)$
 $x = -1, x = -3$

b) $x^2 - 6x = 16$
 $x^2 - 6x - 16 = 0$
 $(x+2)(x-8)$
 $x = -2, x = 8$

d) $x^2 - 4x = -1$
 $x^2 - 4x + 1 = 0$
 QUAD FORMULA

22. Solve the following equations:

21. Use the discriminant to determine the type and number of solutions for $4x^2 + 4 = -8x$.

A) 1 non-real complex
 B) 1 real
 C) 2 non-real complex
 D) 2 real

$4x^2 + 8x + 4 = 0$
 $(4x+4)(x+1) = 0$
 $x = -1, x = -1$

20. Use the discriminant to determine the type and number of solutions for $2x^2 + 7 = -4x$.

$2x^2 + 4x + 7 = 0$

$b^2 - 4ac = 4^2 - 4(2)(7) = 16 - 56 = -40$

$\sqrt{b^2 - 4ac} = \sqrt{-40}$

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-4 \pm \sqrt{-40}}{4}$

$x = \frac{-4 \pm \sqrt{-40}}{4}$

19. Simplify each:

e) $\frac{2+4!}{3!} - \frac{5!}{3!}$
 $\frac{2+24}{6} - \frac{120}{6} = \frac{26}{6} - 20 = \frac{13}{3} - 20 = \frac{13 - 60}{3} = \frac{-47}{3}$

f) $\frac{(3+2!)(4-1)}{(4+!)(4-!)} = \frac{(3+2)(4-1)}{(4+1)(4-1)} = \frac{5 \cdot 3}{5 \cdot 3} = 1$

g) $\frac{(2+4!)(-4+2!)}{3!} = \frac{(2+24)(-4+2)}{6} = \frac{26 \cdot (-2)}{6} = \frac{-52}{6} = \frac{-26}{3}$

25. Divide. Find the quotient and remainder.

a) $(6x^2 + 7x - 6) \div (3x + 2)$

$$\begin{array}{r} 2x + 1 \\ \underline{3x + 2} \\ 6x^2 + 7x - 6 \\ \underline{-(6x^2 + 4x)} \\ 3x - 6 \\ \underline{-(3x + 2)} \\ -8 \\ \underline{-8} \\ -8 \\ \underline{-8} \\ 0 \end{array}$$

c) $(x^3 + 2x^2 - 4) \div (x - 3)$

$$\begin{array}{r} 31120-4 \\ \downarrow \\ \begin{array}{r} 3 \\ \underline{1} \\ 2 \\ \underline{3} \\ 15 \\ \underline{15} \\ 0 \\ \underline{4} \\ 41 \end{array} \\ \begin{array}{r} x^3 + 2x^2 + 5x + 15 \\ \underline{-(x^3 - 3x^2 + 15)} \\ 5x + 15 \end{array} \end{array}$$

d) $(2x^2 - 13x + 11) \div (x + 6)$

$$\begin{array}{r} -6 \\ \underline{-6} \\ 2 \\ \underline{-12} \\ 11 \\ \underline{11} \\ 0 \end{array}$$

b) $(-2x^3 + 11x^2 - 8x - 7) \div (2x + 1)$

$$\begin{array}{r} 2x + 1 \\ \underline{-2x^3 + 11x^2 - 8x - 7} \\ -2x^3 + 2x^2 - 8x - 7 \\ \underline{-(2x^3 + x^2 - 7)} \\ -3x^2 - 8x \\ \underline{-(12x^2 + 6x)} \\ 9x^2 - 14x - 7 \\ \underline{-(12x^2 + 6x)} \\ -3x^2 - 14x - 7 \\ \underline{-(3x^2 + 1.5x - 1.75)} \\ -10.5x - 5.25 \\ \underline{-10.5x - 5.25} \\ 0 \end{array}$$

26. a)

Is $(x+1)$ a factor of $P(x) = 5x^2 + 11x + 6$?

NO

$$\begin{array}{r} -11 \\ \underline{-11} \\ 5 \\ \underline{5} \\ 16 \\ \underline{16} \\ -10 \end{array}$$

How do you know? $R \neq 0$

b)

Is $(x-3)$ a factor of $P(x) = 3x^4 + 3x^3 - 2x^2 - 2x$?

doesn't go in evenly

$$\begin{array}{r} 3 \\ \underline{3} \\ 3 \\ \underline{3} \\ 3 \\ \underline{3} \\ 0 \end{array}$$

27. Factor by grouping.

a) $x^3 - x^2 + 16x - 16$

$$\frac{x^2(x-1) + 16(x-1)}{(x^2+16)(x-1)}$$

28. Find the roots by factoring.

a) $x^4 - 4x^2 + 3 = 0$

$$(x^2-3)(x^2-1)$$

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

b) $4x^3 - 8x^2 - x + 2$

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

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

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

b) $x^4 + 11x^2 + 18 = 0$

$$(x^2+9)(x^2+2)$$

$$x^2+9=0$$

$$x = \pm 3i$$

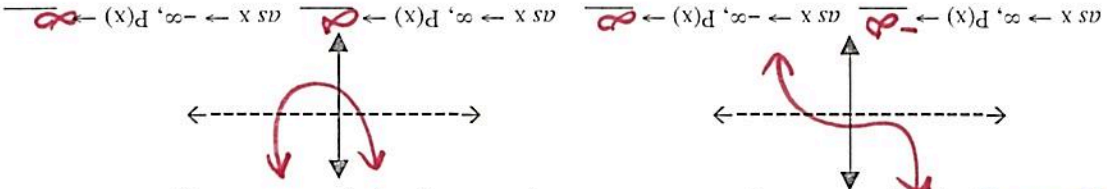
$$x = \pm i\sqrt{2}$$

$$x^2+2=0$$

$$x^2 = -2$$

$$x = \pm i\sqrt{2}$$

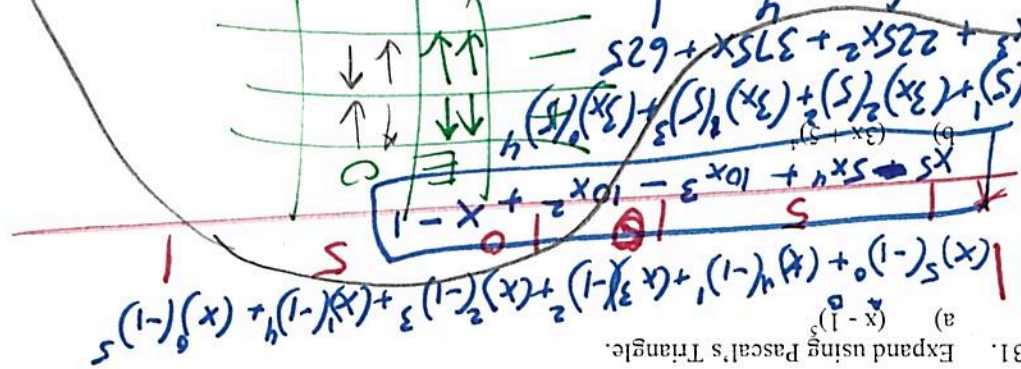
$$\frac{300}{x-3} + 34x + 100$$



b) even degree, positive leading coefficient

a) odd degree, negative leading coefficient

32. Sketch an example of a graph of a polynomial function that has the given characteristics.



31. Expand using Pascal's Triangle.

a) $(x-1)^5$

$$1(x)^5(-1)^0 + (5)(x)^4(-1)^1 + (10)(x)^3(-1)^2 + (10)(x)^2(-1)^3 + (5)(x)^1(-1)^4 + (1)(x)^0(-1)^5$$

1	5	10	10	5	1
1	4	6	4	1	
1	3	3	1		
1	2	1			
1	1				

b) $(3x+5)^4$

$$1(3x)^4(5)^0 + (4)(3x)^3(5)^1 + (6)(3x)^2(5)^2 + (4)(3x)(5)^3 + (1)(5)^4$$

Expand $x^2 - 2x + \sqrt{5}x - 2\sqrt{5}$

$(x + \sqrt{5})(x - 2)$

c) $x = 2, -\sqrt{5}$

b) $x = -4, 41$

a) $(x-1)(x+5)(x+6)$

$x = 1, -5, -6$

30. Write the simplest polynomial with the following roots. Write answer in expanded form.

then factor.

Synthetic division on the correct roots

check on calculator

$$\frac{P}{P} = \frac{1}{1, 2, 3, 4, 6, 12}$$

b) Solve $x^4 + 4x^3 + 7x^2 + 16x + 12 = 0$, by finding all the roots.

$$\begin{array}{r} 1 \quad 4 \quad 7 \quad 16 \quad 12 \\ \underline{-1 \quad -4 \quad -4 \quad 0} \\ 0 \quad 0 \quad 3 \quad 16 \quad 12 \end{array}$$

$(x-2)(x-2)(x-2)$

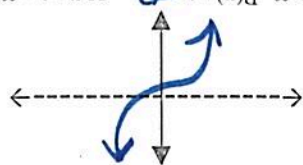
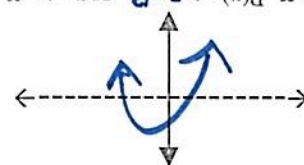
a) Solve $x^3 - 6x^2 + 12x - 8 = 0$, by finding all the roots.

$$\frac{P}{P} = \frac{1}{1, 2, 4, 8}$$

2 Mult. 3

32. Sketch an example of a graph of a polynomial function that has the given characteristics. Then, describe the end behavior.

- c) even degree, negative leading coefficient
- d) odd degree, positive leading coefficient



as $x \rightarrow \infty, P(x) \rightarrow -\infty$ as $x \rightarrow -\infty, P(x) \rightarrow -\infty$

as $x \rightarrow \infty, P(x) \rightarrow \infty$ as $x \rightarrow -\infty, P(x) \rightarrow \infty$

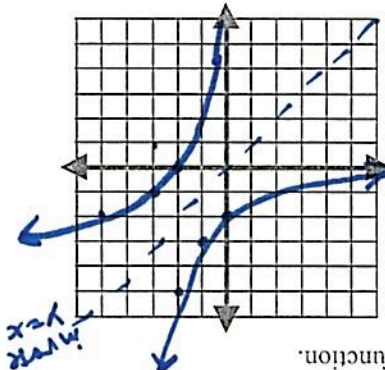
Chapter 7

33. Make a table of at least 5 values and graph $f(x)$ and $f^{-1}(x)$. Include the line of symmetry. State the inverse function.

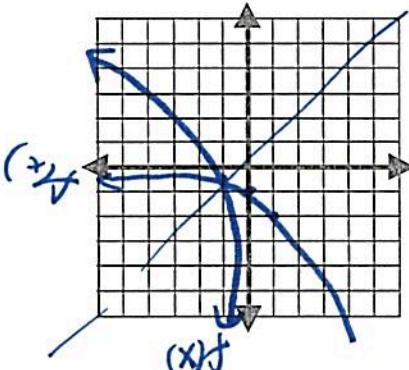
a) $f(x) = 2^x + 1$

x	y
1	2
2	3
3	5
4	17
5	33

x	y
2	1
3	2
5	3
17	4
33	5



x	y
1	1/2
2	1
3	2
5	4
17	16



34. Find the inverse for

a) $f(x) = 3(x+1)$

$x = 3(y+1)$
 $\frac{x}{3} = y+1$
 $y = \frac{x}{3} - 1$

b)

$g(x) = \sqrt{x+1}$

$x = \sqrt{y+1}$
 $x^2 = y+1$
 $y = x^2 - 1$

35. Determine the base of $\log_2 8$

a) Determine the base of $\log_2 8$

A) 3
 B) 2
 C) 4
 D) 8

b) Determine the base of $\log_{10} 10$

A) 2
 B) 0
 C) 10
 D) 1

36. Simplify: a) $\log_{100} 2 = 4$

$2 \log_{100} 100 = 2(2) = 4$

b) $\log_2 32^x = 5x$

$x \log_2 32 = x(5) = 5x$

37. The population of a small farming community is declining at a rate of 7% per year. If the population was 8,500 in 2004, what will the population be in 2009?

$A = 8500(1 - 0.07)^5 = \text{calculator}$

38. Halle deposited \$4,000 into an account that earns 5% interest each year. In how many years will her account be \$10,000.

$$10,000 = 4000(1 + .05)^x$$

$$Y = 4000(1 + .05)^x$$

FIND $\geq 10,000$ in chart

39. Acidity is measured in pH as given by the function $pH = -\log[H^+]$ where $[H^+]$ represents the hydrogen ion concentration in moles per liter.

a) The hydrogen ion concentration in moles per liter of a certain solvent is 0.00794. What is the pH concentration in the solvent?
 $-\log(0.00794)$

b) The pH level for a certain brand of tomato-vegetable juice is 3.5. What is the hydrogen ion concentration of the juice?
 $3.5 = -\log x$
 calculator
 chart

40. Write each in logarithmic form:

a) $3^5 = 243$
 $\log_3 243 = 5$

b) $51^0 = 1$
 $\log_{51} 1 = 0$

c) $16^{1.5} = 64$
 $\log_{16} 64 = 1.5$

41. Write as a single logarithm.

a) $2 \log x - \log 10$
 $\log(x^2/10)$

b) $\log_3 x + \log_3 5$
 $\log_3 5x$

$\div \rightarrow$ $+$ $\rightarrow *$

Use the properties of logarithms to simplify each.

c) $\log_6 54 + \log_6 4$
 $\log_6 216 = 3$

d) $\log_2 128 - \log_2 8$
 $\log_2 \frac{128}{8} = \log_2 16 = 4$

Chapter 8

42. a) If y varies directly with x , find the constant of variation, k , when $y = 12$ and $x = -3$.

$$y = kx \Rightarrow 12 = k(-3)$$

$$k = -4$$

b) y varies jointly with x and z . $y = 10$ when $x = 2$ and $z = 3$. Find k .

$$y = kxz$$

$$10 = k(2)(3)$$

$$10 = 6k$$

$$k = 10/6 = 5/3$$

42. c) y varies inversely as x and directly with z. y = 6 when x = -2 and z = 4. Find k.

$$y = \frac{kz}{x} \Rightarrow 6 = \frac{k(4)}{-2} \Rightarrow -12 = 4k \Rightarrow k = -3$$

43. Simplify each. Assume that all variables are positive.

a) $\sqrt[3]{27x^{12}}$

$3x^4$

b) $\sqrt[5]{32x^{10}}$

$2x^2$

c) $\frac{4}{\sqrt{3}} \sqrt{3}$

$\frac{3}{4\sqrt{3}}$

d) $\sqrt{-72}$

$$\sqrt{-72} = \sqrt{-1 \cdot 36 \cdot 2} = \sqrt{-1} \cdot \sqrt{36} \cdot \sqrt{2} = i \cdot 6 \cdot \sqrt{2} = 6i\sqrt{2}$$

44. Multiply or divide. Assume that all expressions are defined.

a) $\frac{x+2}{4x-4} \cdot \frac{x-1}{x^2-4}$

$\frac{(x-1)(x-2)}{(x-2)(x-2)}$

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

b) $\frac{x^2-2x+1}{x^2+5x+6} \div \frac{x+3}{x-1}$

$\frac{(x-1)(x-1)}{(x-1)(x+1)(x+2)} \cdot \frac{(x-1)}{(x+3)}$

45. Add or Subtract. Identify any x-values for which the expression is undefined.

a) $\left\{ \begin{array}{l} 2 \\ 5x-1 \end{array} \right\} \frac{x+3}{3x} + \frac{2x+6}{3x}$

b) $\frac{3x}{x^2-x-6} - \frac{x^2-8x+15}{5}$

$$\frac{2x+6}{10x-1+3x} = \frac{2x+6}{13x-1} = \frac{(x-5)(x-3)(x+2)}{(x-5)(x-3)(x+2)} + \frac{(x-5)(x-3)(x+2)}{-5} = \frac{(x-5)(x-3)(x+2)}{(x+2)(x-3)}$$

$$\frac{(x+5)(x-3)(x+2)}{3x(x-5)-5(x+2)} = \frac{(x+5)(x-3)(x+2)}{3x^2-20x-10}$$

46. Solve:

a) $\left(\frac{x}{8} + \frac{x}{3} = \frac{x}{x-1} \right) x(x-1)$

$x = -3$

$x = \frac{11}{5}$

$$11(x-1) = 6x \Rightarrow 11x - 11 = 6x \Rightarrow 5x = 11 \Rightarrow x = \frac{11}{5}$$

VA: $x=4$
 HA: $y=1/3$
 zeros: 2
 holes: $x=-4$

$$f(x) = \frac{x^2 + 2x - 8}{3x^2 - 48} = \frac{(x+4)(x-2)}{3(x+4)(x-4)}$$

VA: $x=2$
 HA: $y=1/3$
 zeros: -2
 holes: $x=2$
 $N > D$

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

49. For each rational function identify any holes, zeros, and asymptotes:

a) $f(x) = \frac{1}{x+4} - 3$
 VA: $x=-4$
 HA: $y=-3$

b) $f(x) = \frac{x}{x-8} + 6$
 VA: $x=8$
 HA: $y=6$

48. Using transformations identify the Vertical (VA) and Horizontal (HA) asymptotes:

a) $\sqrt{x+2} - 5 = 0$
 $\sqrt{x+2} = 5$
 $x+2 = 25$
 $x = 23$
 c) $x+2 = \sqrt{3x+6}$

b) $\frac{1}{x+5} = 2$
 $x+5 = 8$
 $x = 3$
 d) $-\sqrt{-3x+7} - x = -1$

After Break

b) $\frac{2x+7}{x^2-7x} + \frac{1}{2} = \frac{x-7}{3}$
 $2x(x-7)$

47. Solve:

46. Solve:

$x =$