

$$\begin{aligned}
 & \text{1.} \quad \text{1/} \quad -[2x(x-1) + 1 - x^2] + [-2(2-x) - (x-3)(x-1)] \\
 \text{(16)} \quad & = -[2x^2 - 2x + 1 - x^2] + [-4 + 2x - (x^2 - 4x + 3)] \\
 & = -[x^2 - 2x + 1] + [-4 + 2x - x^2 + 4x - 3] \\
 & = -x^2 + 2x - 1 + [-7 + 6x - x^2] \\
 & = -x^2 + 2x - 1 - 7 + 6x - x^2 \\
 & = -2x^2 + 8x - 8
 \end{aligned}$$

(-2) per algebra mistake

$$\begin{aligned}
 \text{(21)} \quad & 3[x^2(-2x-4) - (-4)(2+x(-1-x))] - [2x(-x+2)](x-1) \\
 & = 3[-2x^3 - 4x^2 - (-4)(2-x-x^2)] - [2x(-x^2+3x-2)] \\
 & = 3[-2x^3 - 4x^2 + 8 - 4x - 4x^2] - [-2x^3 + 6x^2 - 4x] \\
 & = 3[-2x^3 - 8x^2 + 8 - 4x] + 2x^3 - 6x^2 + 4x \\
 & = -6x^3 - 24x^2 + 24 - 12x + 2x^3 - 6x^2 + 4x \\
 & = -4x^3 - 30x^2 - 8x + 28
 \end{aligned}$$

$$\begin{aligned}
 \text{31} \quad & -3(x+1)(x^2+2x-1) - [5x-2+(x^2-1)x] \\
 & = -3[x^3+2x^2-x+x^2+2x-1] - [5x-2+x^3-x] \\
 & = -3[x^3+3x^2+x-1] - [x^3+4x-2] \\
 & = -3x^3 - 9x^2 - 3x + 3 - x^3 - 4x + 2 \\
 & = -4x^3 - 9x^2 - 7x + 5
 \end{aligned}$$

$$\begin{aligned} & -x^2[-1-x^2+2x]-3[2x(x+1)+x^2-1] \\ & = +x^2+x^4-2x^3-3[2x^2+2x+x^2-1] \\ & = x^2+x^4-2x^3-3[3x^2+2x-1] \\ & = x^2+x^4-2x^3-9x^2-6x+3 \\ & = x^4-2x^3-8x^2-6x+3 \end{aligned}$$

Homework #3 Sections 3.1, 3.2, 3.4 Due Monday 10/19/09

Section 3.1: 6, 8, 10, 22(domain only), 24(domain only), 30, 32, 38, 44, 52, 56

12) 6. See figures on page 141.

(a) Which is a function?

[2] F is a function - one value assigned for x, y, z. <-Ans

[6] [2] G is not a function - y is not assigned a value <-Ans

[2] H is a function - one value assigned for x, y, and z. <-Ans

(b) What is the range for the functions?

[2], [3] F has range {1} H has range {1,2} <-Ans

8. See figure for exercise 8 on page 141,

(a) Which is a function?

F and G are functions <-Ans

(b) What is the range for the functions?

F has with range {i, j}. <-Ans

G has range {k}. <-Ans

10. Determine the domain of each function.

(a)  $s=3t+12$  Domain =  $(-\infty, \infty)$  <-Ans

(b)  $s=1/(3t+12)$  This is not defined where  $3t+12=0 \Rightarrow t=-4$  causes division by 0. Domain =  $(-\infty, -4) \cup (-4, \infty)$  <-Ans

(c)  $s=\sqrt{3t+12}$  This is defined where  $3t+12 \geq 0$  or where  $t \geq -4$   
Domain =  $[-4, \infty)$  <-Ans

(d)  $s=\sqrt[3]{3t+12}$  This is defined everywhere. Domain =  $(-\infty, \infty)$  <-Ans

22. Determine the domain only of the function:

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

The denominator is zero only at  $x=0$ . The function is defined everywhere else. Domain =  $(-\infty, 0) \cup (0, \infty)$  <-Ans

12) 24. Determine the domain only of the functions below.

[6] (a)  $g(x) = \frac{2x-7}{3x+24}$

The denominator is zero where  $3x+24=0$ . This occurs at  $x=-8$ . The function is defined everywhere else. Domain =  $(-\infty, -8) \cup (-8, \infty)$  <-Ans

[6] (b)  $G(x) = \frac{2x^3-7}{3x^3+24}$

The denominator is zero where  $3x^3+24=0$ . This occurs at  $x=-2$ . The function is defined everywhere else. Domain =  $(-\infty, -2) \cup (-2, \infty)$  <-Ans

or  $\mathbb{R} - \{-8\}$   
or "all x except -8"  
or  $\mathbb{R} - \{-2\}$   
or "all x except -2"

Homework #3 -- Sections 3.1, 3.2, 3.4 Due Monday 10/19/09

30. Let  $H(x) = 1 - x + x^2 - x^3$

(a) Which is larger  $H(0)$  or  $H(1)$ ?

$$H(0) = 1 \qquad H(1) = 1 - 1 + 1 - 1 = 0$$

$$H(0) > H(1) \quad \leftarrow \text{Ans}$$

(b) Find  $H(1/2)$ . Does  $H(1/2) + H(1/2) = H(1)$ ?

$$H(1/2) = 1 - (1/2) + (1/2)^2 - (1/2)^3 = 1 - 1/2 + 1/4 - 1/8 = 5/8 \quad \leftarrow \text{Ans}$$

$$H(1/2) + H(1/2) = 5/4 \neq 0 \quad \text{No!} \quad \leftarrow \text{Ans}$$

32. Let  $f(x) = 4 - 3x$ . Find the following.

(a)  $f(2) = 4 - 3(2) = -2 \quad \leftarrow \text{Ans}$

(b)  $f(-3) = 4 - 3(-3) = 13 \quad \leftarrow \text{Ans}$

(c)  $f(2) + f(-3) = -2 + 13 = 11 \quad \leftarrow \text{Ans}$

(d)  $f(2+3) = f(5) = 4 - 3(5) = -11 \quad \leftarrow \text{Ans}$

(e)  $f(2x) = 4 - 3(2x) = 4 - 6x \quad \leftarrow \text{Ans}$

(f)  $2f(x) = 2[4 - 3(x)] = 8 - 6x \quad \leftarrow \text{Ans}$

(g)  $f(x^2) = 4 - 3(x^2) = 4 - 3x^2 \quad \leftarrow \text{Ans}$

(h)  $f(1/x) = 4 - 3(1/x) = 4 - 3/x \quad \leftarrow \text{Ans}$

(i)  $f(f(x)) = f(4 - 3x) = 4 - 3(4 - 3x) = 4 - 12 + 9x = 9x - 8 \quad \leftarrow \text{Ans}$

(j)  $x^2 f(x) = x^2(4 - 3x) = 4x^2 - 3x^3 \quad \leftarrow \text{Ans}$

(k)  $1/f(x) = 1/(4 - 3x) \quad \leftarrow \text{Ans}$

(l)  $f(-x) = 4 - 3(-x) = 4 + 3x \quad \leftarrow \text{Ans}$

(m)  $-f(x) = -(4 - 3x) = -4 + 3x$  or  $3x - 4 \quad \leftarrow \text{Ans}$

(n)  $-f(-x) = -[4 - 3(-x)] = -[4 + 3x] = -4 - 3x \quad \leftarrow \text{Ans}$

38. Let  $g(t) = (4t - 6)/(t - 4)$ . Find all real solutions for the equations below.

(a)  $g(t) = 14$

$$\frac{4t-6}{t-4} = 14 \quad \text{Multiply both sides by } t-4$$

$$4t-6 = 14(t-4)$$

$$4t-6 = 14t-56$$

$$50 = 10t$$

$$t = 5 \quad \leftarrow \text{Ans}$$

(b)  $g(t) = 4$

$$\frac{4t-6}{t-4} = 4 \quad \text{Multiply both sides by } t-4$$

$$4t-6 = 4(t-4)$$

$$4t-6 = 4t-16$$

$$-6 = -16$$

No solution  $\leftarrow \text{Ans}$

Note: When variable cancels and one side not equal the other, the equation is inconsistent (no solution). Actually 4 is a horizontal asymptote which we will learn about later. (See next page)

(c)  $g(t) = 0$

$$\frac{4t-6}{t-4} = 0 \quad \text{Multiply both sides by } t-4$$

$$4t-6=0$$

$$4t=6$$

$$t = 3/2 \quad \leftarrow \text{Ans}$$

12 44. Let  $T = 2x^2 - 3x$ . Find and simplify each expression.

[4] (a)  $T(x+h) = 2(x+h)^2 - 3(x+h) = 2x^2 + 4xh + 2h^2 - 3x - 3h \quad \leftarrow \text{Ans}$

[4] (b)  $T(x-h) = 2(x-h)^2 - 3(x-h) = 2x^2 - 4xh + 2h^2 - 3x + 3h \quad \leftarrow \text{Ans}$

[4] (c)  $T(x+h) - T(x-h) = 8xh - 6h \quad \leftarrow \text{Ans}$

(-2 per algebra error.

52. Let  $f(t) = (t-x)/(t+x)$ . Show that  $f(x+y) + f(x-y) = \frac{-2y^2}{x^2 + 2xy}$ .

Substitute in  $x+y$  and  $x-y$  to get:

$$\frac{(x+y)-x}{(x+y)+y} + \frac{(x-y)-x}{(x-y)+y} = \frac{y}{x+2y} + \frac{-y}{x} = \frac{yx}{x(x+2y)} + \frac{-y(x+2y)}{x(x+2y)} = \frac{-2y^2}{x^2 + 2xy} \quad \leftarrow \text{Ans}$$

56. If  $g(x) = x^2 - 3xk - 4$  and  $g(1) = -2$ , find  $k$ .

$$g(1) = (1)^2 - 3k(1) - 4 = -2$$

$$1 - 3k - 4 = -2$$

$$-3k = 1$$

$$k = -1/3 \quad \leftarrow \text{Ans}$$

**Section 3.2: 2, 4, 6, 18, 22, 24**

2. Find the point P on the graph of the function below. Give an exact expression and one rounded to three decimal places.

$$y = x^3 \quad y = -\pi^3/8 \quad \leftarrow \text{Ans} \quad (\text{exact answer})$$

$$y = -\pi^3/8 \cong -3.876 \quad \leftarrow \text{Ans} \quad (\text{Approximation})$$

4 Find the point P on the graph of the function below. Give an exact expression and one rounded to three decimal places.

$$C(x) = \sqrt{1-x^2} \quad C(-1/2) = \sqrt{1-(1/2)^2} = \sqrt{3/4} = \sqrt{3}/2 \quad \leftarrow \text{Ans} \quad (\text{exact answer})$$

$$C(x) = \sqrt{1-x^2} \quad C(-1/2x) = \sqrt{1-(1/2)^2} = \sqrt{3/4} \approx 0.866 \quad \leftarrow \text{Ans} \quad (\text{approximation})$$

6. Use the vertical line test to determine if each graph is a function. The graphs are on page 153.

A vertical line anywhere on each graphs (a), (b) and (d) crosses the graph only once. Therefore these graphs are functions.  $\leftarrow \text{Ans}$  For graph (c), one  $x$  value has two values associated with it. This is not a function.  $\leftarrow \text{Ans}$

Homework #3 – Sections 3.1, 3.2, 3.4 Due Monday 10/19/09

18. Interpretation of the graph of  $h(x)$  on page 155.

(a) Find  $h(a)$ ,  $h(b)$ ,  $h(c)$ , and  $h(d)$ :

$$h(a) = 3, h(b) = 0, h(c) = 0, h(d) = 2 \quad \leftarrow \text{Ans}$$

(b)  $h(0)$  is negative since it is below the  $x$  axis.  $\leftarrow \text{Ans}$

(c) For which values of  $x$  does  $h(x) = 0$ ?  $x = b$  and  $x = c$   $\leftarrow \text{Ans}$

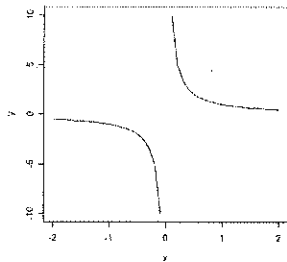
(d)  $h(b) > h(0)$  since  $0 >$  any negative value.  $\leftarrow \text{Ans}$

(e)  $h(x)$  increases in the interval from  $c$  to  $d$ .  $\leftarrow \text{Ans}$

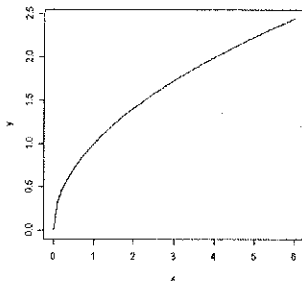
(f)  $h(x)$  decreases in the interval from  $a$  to  $b$ .  $\leftarrow \text{Ans}$

22. Graph each of the functions below.

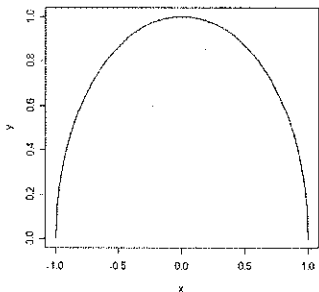
(a)  $y = 1/x$  Make a table from  $x = -2$  to  $2$ , and evaluate  $y$  every increment of about  $1/2$ . Join points with a smooth curve.



(b)  $y = \sqrt{x}$  Note: Defined for  $x > 0$ . Make a table from 0 to 6 and evaluate  $y$  about every integer. Join points with a smooth curve.



(c)  $y = \sqrt{1-x^2}$  Make a table from  $-1$  to  $1$  and evaluate  $y$  in about  $1/4$  unit increments. Join points with a smooth curve.



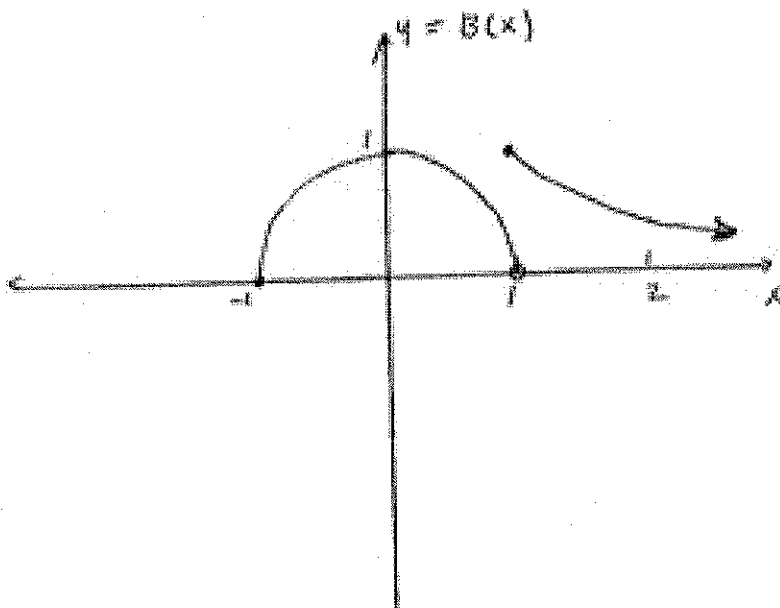
Homework #3 – Sections 3.1, 3.2, 3.4 Due Monday 10/19/09

24. Sketch a graph of the function:

$$B(x) = \begin{cases} \sqrt{1-x^2} & \text{if } -1 \leq x < 1 \\ 1/x & \text{if } x \geq 1 \end{cases}$$

We know that the first part is the half circle with radius 1. Calculate a few points for  $1/x$  at  $x=1$ ,  $x=2$  and  $x=4$  noting that it is approaching 0. Make the point on the half circle at  $(1,0)$  an open dot. Make the point at  $(1,1)$  a closed dot. Hand drawn graph is below.

*Graph for problem 24, Section 3.2*



12

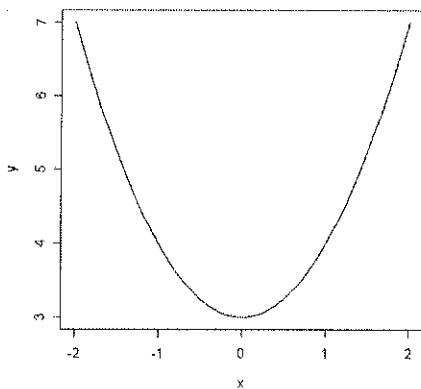
Section 3.4: 2, 4, 6, 8, 10, 18

2. Match the equation with the instructions.

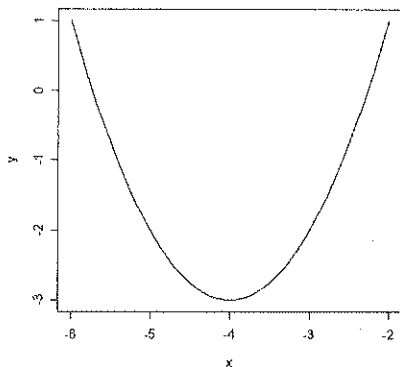
- (a)  $y = f(x+2) + 3$      $\rightarrow$     (K) <-Ans
- (b)  $y = f(x+3) + 2$      $\rightarrow$     (B) <-Ans
- (c)  $y = f(x-2) + 2$      $\rightarrow$     (J) <-Ans
- (d)  $y = f(x-2) - 3$      $\rightarrow$     (L) <-Ans
- (e)  $y = f(x+2) - 3$      $\rightarrow$     (A) <-Ans
- (f)  $y = f(x-3) + 2$      $\rightarrow$     (C) <-Ans
- (g)  $y = f(x-3) - 2$      $\rightarrow$     (E) <-Ans
- (h)  $y = f(x+3) - 2$      $\rightarrow$     (D) <-Ans
- (i)  $y = -f(x+2)$      $\rightarrow$     (H) <-Ans
- (j)  $y = -f(x-2)$      $\rightarrow$     (G) <-Ans
- (k)  $y = f(2-x)$      $\rightarrow$     (I) <-Ans    Shift first  $\rightarrow f(x+2)$  then  
reflect  $\rightarrow f(-x+2)$  or  $f(2-x)$
- (l)  $y = f(-x) + 2$      $\rightarrow$     (F) <-Ans

4. Sketch the graph of  $y = x^2 + 3$

This is the basic parabola function shifted up 3 units. The sketch is below.



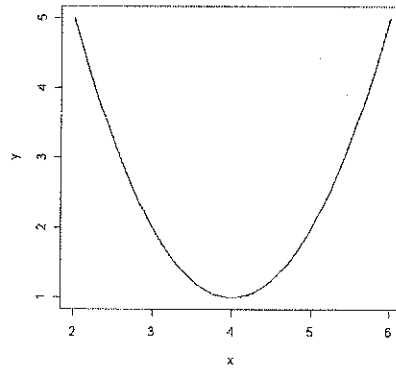
6. Sketch the graph of  $y = (x+4)^2 - 3$ . This is the basic parabola function shifted left 4 units and down 3 units.



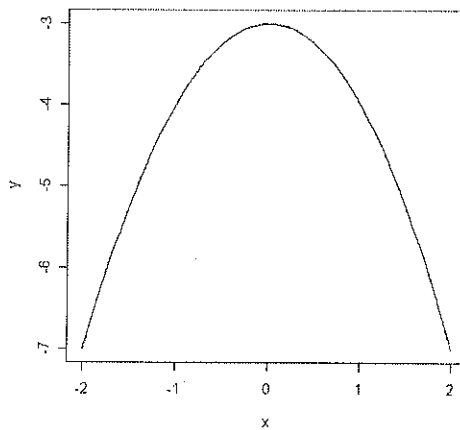


Homework #3 – Sections 3.1, 3.2, 3.4 Due Monday 10/19/09

8. Sketch the graph of  $y=(x-4)^2+1$ . This is the basic parabola function shifted right 4 units and up 1 units.

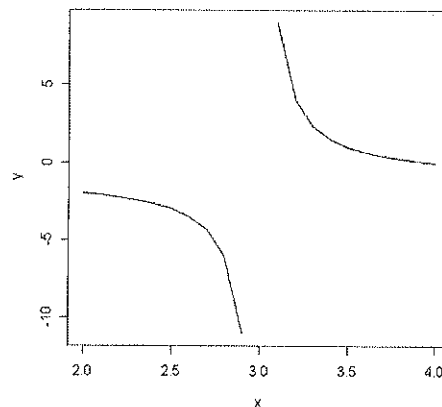


10. Sketch the graph of  $y=-x^2-3$ . This is the basic parabola function reflected in the x-axis and shifted down 3 units.



18. Sketch the graph of  $y=\frac{1}{x-3}-1$ . This is the basic  $1/x$  function shifted right 3 units and down 1 units.

[10]



[5] for the right shape  
[5] for the right position

