

# 7.4 Foundations of Math II

p. 391 #1, 4, 5, 11

1. a)  $f(x) = (x-1)(x+4)$  opens up, zeros = 1, -4  
graph iii
  - b)  $f(x) = (x+1)(x-4)$  opens up, zeros = -1, 4  
graph ii
  - c)  $f(x) = (x+1)(x+4)$  opens up, zeros = -1, -4  
graph v
  - d)  $f(x) = (x-1)(x-4)$  opens up, zeros 1, 4  
graph vi
  - e)  $f(x) = (1-x)(x+4)$  opens down, zeros 1, -4  
 $-1(-1+x)(x+4)$   
 $-1(x-1)(x+4)$  graph iv
  - f)  $f(x) = (x+1)(4-x)$  opens down, zeros -1, 4  
 $(x+1)(-1)(-4+x)$   
 $-1(x+1)(x-4)$  graph i
4. a)  $f(x) = (x-1)(x+1)$  y-intercept:  $y = 1(-1)$   
 $x-1=0$      $x+1=0$      $y = -1$   
 $x=1$      $x=-1$   
 x-intercepts: 1, -1

equation of axis of symmetry:  $x = \frac{-1+1}{2}$

x-value of vertex: 0     $x = \frac{0}{2}$   
 y-value of vertex:  $y = (0-1)(0+1)$  ← replace x's with 0  
 $y = (-1)(1)$   
 $y = -1$     vertex (0, -1)  
 $x = 0$

P. 391 cont

4. b)  $f(x) = (x+2)(x+2)$

$$x+2=0$$

$$x=-2$$

x-intercept:  $-2$

eq. of axis of sym:  $x = \frac{-2+(-2)}{2}$

$$x = \frac{-4}{2}$$

$$x = -2$$

y-intercept:  $y = (-2)(-2)$   
 $y = 4$

x-value of vertex:  $-2$

y-value of vertex:

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

$$y = 0 \cdot 0$$

$$y = 0$$

vertex:  $(-2, 0)$

replac  
x's  
with  
-2

c)  $f(x) = (x-3)(x-3)$

x-intercept:

$$x-3=0$$

$$x=3$$

eq. of axis of sym:  $x = \frac{3+3}{2}$

$$x = \frac{6}{2}$$

$$x = 3$$

y-intercept:  $y = 3 \cdot 3$   
 $y = 9$

x-value of vertex:  $3$

y-value of vertex:

$$y = (3-3)(3-3)$$

$$y = 0 \cdot 0$$

$$y = 0$$

vertex  $(3, 0)$

d)  $f(x) = -2(x-2)(x+1)$

x-intercepts:

$$x-2=0$$

$$x+1=0$$

$$x=2$$

$$x=-1$$

eq. of axis of sym:  $x = \frac{2+(-1)}{2}$

$$x = \frac{1}{2}$$

y-intercept:  $y = -2(2)(-1)$   
 $y = 4$

x-value of vertex:  $\frac{1}{2}$

y-value of vertex:

$$y = -2\left(\frac{1}{2}-2\right)\left(\frac{1}{2}+1\right)$$

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

$$y = \frac{18}{4}$$

$y = \frac{9}{2}$  vertex  $\left(\frac{1}{2}, \frac{9}{2}\right)$

D. 391 cont.

4. e)  $f(x) = 3(x-2)^2$   
 $f(x) = 3(x-2)(x-2)$   
x-intercept:  
 $x-2=0$   
 $x=2$

eq. of axis of sym:  $x = \frac{2+2}{2}$

$$x = \frac{4}{2}$$

$$x = 2$$

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

x-intercept:  
 $x-1=0$   
 $x=1$

eq. of axis of sym:  $x = \frac{1+1}{2}$

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

$$x = 1$$

y-intercept:  $y = 3 \cdot 2 \cdot 2$   
 $y = 12$

x-value of vertex: 2

y-value of vertex:

$$y = 3(2-2)(2-2)$$

$$y = 3(0)(0)$$

$$y = 0$$

vertex (2, 0)

y-intercept:  $y = 4(1)(1)$   
 $y = 4$

x-value of vertex:

$$y = 4(1-1)(1-1)$$

$$y = 4 \cdot 0 \cdot 0$$

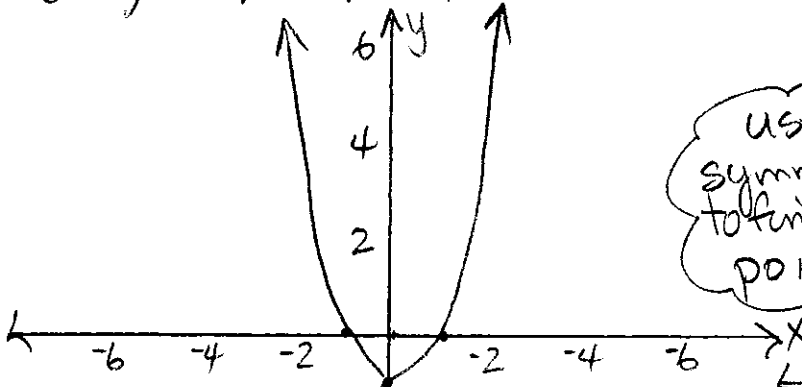
$$y = 0$$

vertex (1, 0)

5. see graph paper

p. 391 cont.

5.a)  $f(x) = (x-1)(x+1)$



domain

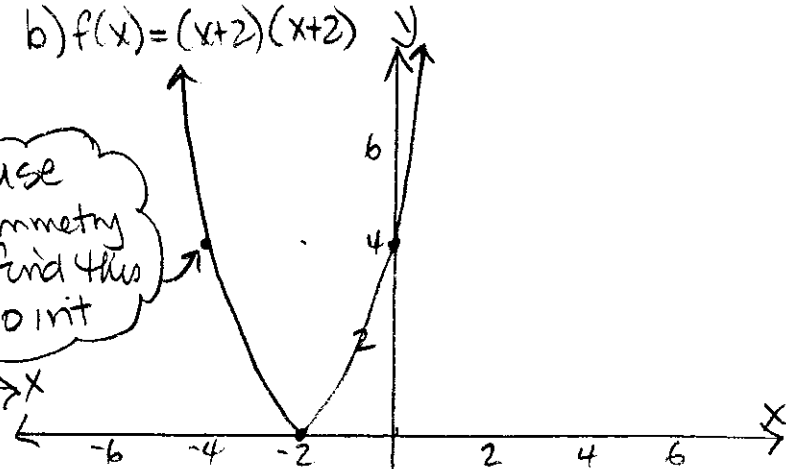
$$\{x | x \in \mathbb{R}\}$$

range

$$\{y | y \geq -1, y \in \mathbb{R}\}$$

b)  $f(x) = (x+2)(x+2)$

use symmetry to find this point



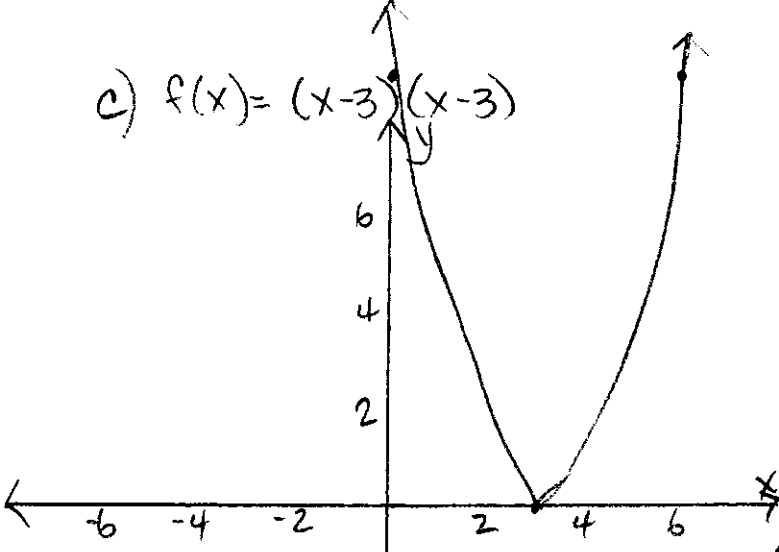
domain

$$\{x | x \in \mathbb{R}\}$$

range

$$\{y | y \geq 0, y \in \mathbb{R}\}$$

c)  $f(x) = (x-3)(x-3)$



domain

$$\{x | x \in \mathbb{R}\}$$

range

$$\{y | y \geq 0, y \in \mathbb{R}\}$$

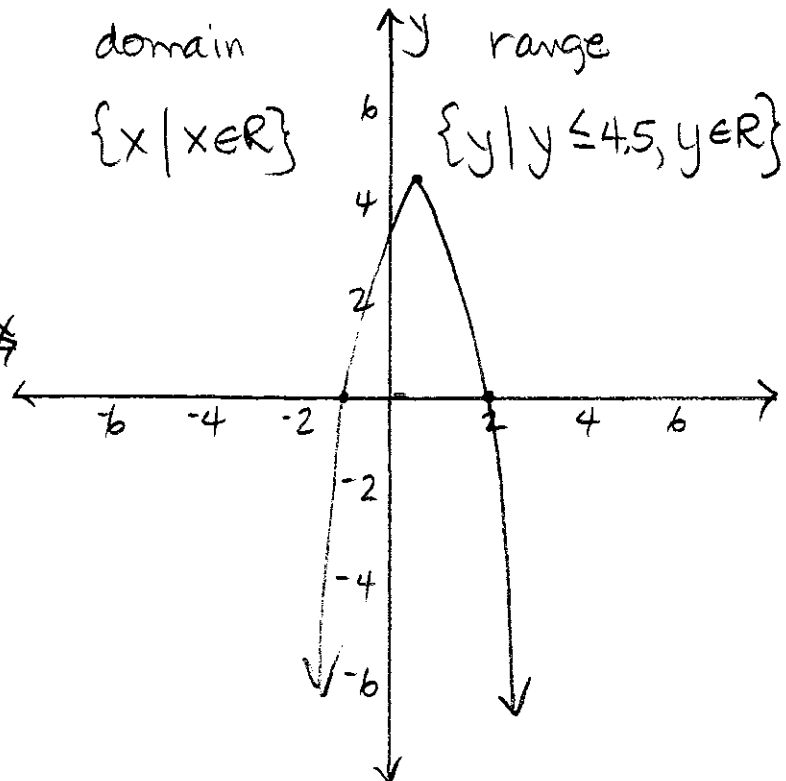
d)  $f(x) = -2(x-2)(x+1)$

domain

$$\{x | x \in \mathbb{R}\}$$

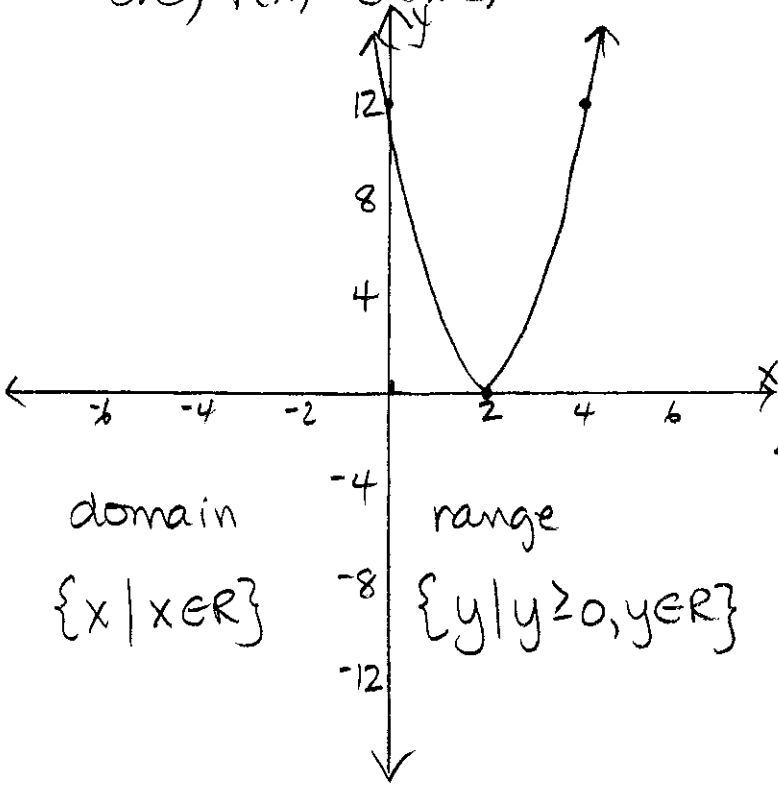
range

$$\{y | y \leq 4.5, y \in \mathbb{R}\}$$

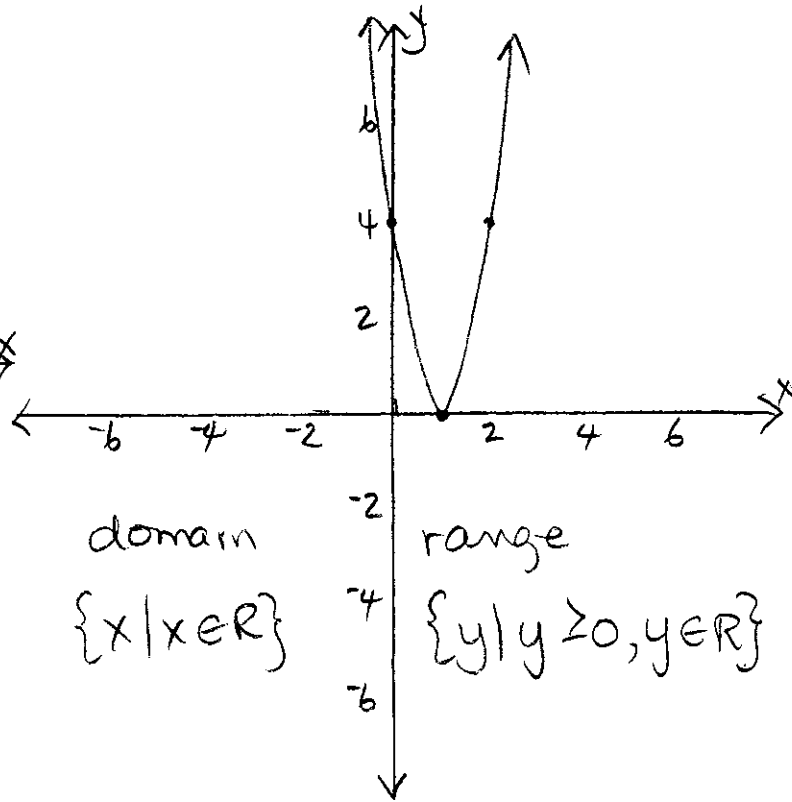


p. 391 cont.

5.e)  $f(x) = 3(x-2)^2$



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



p. 391 cont.

11. a) x-intercepts: -2, 6  
 $x = -2, x = 6$   
 $x + 2 = 0, x - 6 = 0$   
 $y = a(x + 2)(x - 6)$

point on the graph:  $(0, -6)$   
 $-6 = a(0 + 2)(0 - 6)$   
 $-6 = a(2)(-6)$   
 $-6 = a(-12)$   
 $\frac{6}{12} = a$

$y = \frac{1}{2}(x + 2)(x - 6)$  ←  $\frac{1}{2} = a$

b) x-intercepts: 1, 4  
 $x = 1, x = 4$   
 $x - 1 = 0, x - 4 = 0$   
 $y = a(x - 1)(x - 4)$

point on the graph:  $(0, 4)$   
 $4 = a(0 - 1)(0 - 4)$   
 $4 = a(-1)(-4)$   
 $4 = 4a$   
 $1 = a$

$y = (x - 1)(x - 4)$  ←  $1 = a$

c) x-intercepts: -6, 2  
 $x = -6, x = 2$   
 $x + 6 = 0, x - 2 = 0$   
 $y = a(x + 6)(x - 2)$

point on the graph:  $(0, 3)$   
 $3 = a(0 + 6)(0 - 2)$   
 $3 = a(6)(-2)$   
 $3 = -12a$   
 $\frac{3}{-12} = a$

$y = -\frac{1}{4}(x + 6)(x - 2)$  ←  $-\frac{1}{4} = a$

d) x-intercepts: 0, 6  
 $x = 0, x = 6$   
 $x - 6 = 0$

$y = ax(x - 6)$

point on the graph:  $(1, 5)$   
 $5 = a \cdot 1(1 - 6)$   
 $5 = a(-5)$   
 $\frac{5}{-5} = a$

$y = -x(x - 6)$  ←  $-1 = a$