#1

	Is a Function	Is not a function.	There is only 1 y-value for each x value.	There is more than 1 y-value for at least one x-value
a)	✓		✓	
b)		✓		✓
c)		✓		✓
d)	✓		✓	
e)	✓		✓	
f)		✓		✓

2. a) Domain: $\{x \in \mathbb{R}\}$
R: $\{y \in \mathbb{R} \mid y \geq -4\}$

b) D: $\{x \in \mathbb{R} \mid -3 \leq x \leq 5\}$
R: $\{y \in \mathbb{R} \mid -2 \leq y \leq 4\}$

c) D: $\{x \in \mathbb{R} \mid -4 \leq x \leq 5\}$
R: $\{y \in \mathbb{R} \mid -2 \leq y \leq 7\}$

d) D: $\{x \in \mathbb{R}\}$
R: $\{y \in \mathbb{R} \mid y \leq 3\}$

3. $f(x) = 7 - 3x$

a) $f(4) = 7 - 3(4)$
$= 7 - 12$
$= -5$

c) $f(0)$
$= 7$

e) $f(-4)$
$= 7 - 3(-4)$
$= 7 + 12$
$= 19$

g) $f(-0.1) = 7 - 3(-0.1)$
$= 7 + 0.3$
$= 7.3$

4. $f(x) = 2x^2 + x - 8$

a) $f(1) = 2(1)^2 + 1 - 8$
$= 2 + 1 - 8$
$= -5$

b) $f(0) = 2(0)^2 + 0 - 8$
$= -8$

c) $f(-2)$
$= 2(-2)^2 + (-2) - 8$
$= 8 - 2 - 8$
$= -2$

d) $f(-4) = 2(-4)^2 - 4 - 8$
$= 32 - 12$
$= 20$

5. D: $\{-3, -1, 2, 4\}$

a) $f(x) = 4x - 5$
$f(-3) = -17$, $f(-1) = -9$, $f(2) = 3$, $f(4) = 11$
$\therefore$ R: $\{-17, -9, 3, 11\}$

b) $f(x) = -3x^2 + 2x - 1$
$f(-3) = -27 - 6 - 1$
$= -34$

$f(-1) = -3 - 2 - 1$
$= -6$

$f(2) = -12 + 4 - 1$
$= -9$

$f(4) = -48 + 8 - 1$
$= -41$

R: $\{-41, -34, -9, -6\}$

6a) $f(x) = 5x+2$

$f(3a) = 5(3a)+2$
$= 15a+2$

b) $f(x) = 4-7x$
$f(n-4) = 4-7(n-4)$
$= 4-7n+28$
$= 32-7n$

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

$f(2k+3) = 3(2k+3)^2+2(2k+3)-5$
$= 3(4k^2+12k+9)+4k+6-5$
$= 12k^2+36k+27+4k+1$
$= 12k^2+40k+28$

7a) $C = 2.5b$
$b \rightarrow$ number of bottles purchased is the independent variable.
$C \rightarrow$ the cost is the dependent variable.

b) Yes. The function calculates cost when you substitute in number of bottles purchased.
$\rightarrow$ it is a function because when you sub in the number of bottles there is only one possible value for the cost.

8. $S(r) = \frac{4}{3}\pi r^3$

D: $\{r \in \mathbb{R} \mid r \geq 0\}$
R: $\{S \in \mathbb{R} \mid S \geq 0\}$

9. a) $y = \sqrt{x}$ $D = \{x \in \mathbb{R} \mid x \geq 0\}$ $R = \{y \in \mathbb{R} \mid y \geq 0\}$

10. $y = x^2$ and $y = \sqrt{x}$ for $x \geq 0$ are inverses of one another.
$y = x^2$ and $y = -\sqrt{x}$ for $x \leq 0$ are inverses of one another
(inverses are reflected in the line $y = x$).

11. $y = \frac{1}{x}$ D: $\{x \in \mathbb{R} \mid x \neq 0\}$ R: $\{y \in \mathbb{R} \mid y \neq 0\}$

12. x is the reciprocal of $\frac{1}{x}$, $\frac{1}{x}$ is the reciprocal of x

~~so~~ $y = x$ is the graph of the reciprocal of $y = \frac{1}{x}$,
$y = \frac{1}{x}$ is the reciprocal of the graph of $y = x$ for $x \neq 0, y \neq 0$.

13a) $y = f(x) - 3$ shift down 3
b) $y = f(x+6)$ shift left 6

c) $y = f(x-4) - 4$ ← shift down 4, shift Right 4
d) $y = f(x) - 5$ shift down 5.

14 a) left 3 down 2
$y = (x+3)^2 - 2$
b) up 2 right 1
$y = (x-1)^2 + 2$

15. a)+b) i) shift graph down 3
ii) up 4
iii) right 3
iv) left 4
v) left 3, down 2
vi) right 2, up 3.

16. a) line slope 1, y-int −5, x-int 5
b) line slope 1, y-int 6, x-int −6
c) line slope 1, y-int −1, x-int .1 (y=x shifted left 2, down 3)
d) line slope 1, y-int 2, x-int −2

17. a) $y=\sqrt{x}$ shifted down 4 D: $\{x\in\mathbb{R} \mid x \geq 0\}$ R: $\{y\in\mathbb{R} \mid y \geq -4\}$
b) $y=\sqrt{x}$ shifted left 5 D: $\{x\in\mathbb{R} \mid x \geq -5\}$ R: $\{y\in\mathbb{R} \mid y\geq 0\}$
c) $y=\sqrt{x-2}+3$ is $y=\sqrt{x}$ shifted right 2, up 3 D: $\{x\in\mathbb{R} \mid x\geq 2\}$ R: $\{y\in\mathbb{R} \mid y \geq 3\}$
d) $y=\sqrt{x+4}-3$ is $y=\sqrt{x}$ sifted left 4, down 3 D= $\{x\in\mathbb{R} \mid x\geq -4\}$ R= $\{y\in\mathbb{R} \mid y\geq -3\}$.

18. a) $y=(x-5)^2$ ~~shift~~ $y=x^2$ right 5 D: $\{x\in\mathbb{R}\}$ R: $\{y\in\mathbb{R} \mid y\geq 0\}$
b) $y=(x+7)^2$ shift $y=x^2$ left 7 D: $\{x\in\mathbb{R}\}$ R: $\{y\in\mathbb{R} \mid y\geq 0\}$
c) $y=(x+2)^2-6$ shift $y=x^2$ left 2, down 6 D: $\{x\in\mathbb{R}\}$ R: $\{y\in\mathbb{R} \mid y\geq -6\}$
d) $y=(x-3)^2+4$ shift $y=x^2$ right 3, up 4 D: $\{x\in\mathbb{R}\}$, R: $\{y\in\mathbb{R} \mid y\geq 4\}$

19. $C(d)=120d+100$
a) \$100 is the fixed cost (likely cost of insurance or flat fee for gas etc). no matter how many days rented.
b) D: { . $d\in\mathbb{N}$} the set N = Natural Numbers {1, 2, 3, .., 62}
I did not include 0 since there would not be a \$100 charge for no days rental days ... function makes more sense to start at d=1.
R: {220, 340, 460, 580, ..., 7540}
c) shift up 100 units d) $C(d)=120d+60$

#20 i) $y = -f(x)$ ... multiply all y-values by -1
(graph will be reflected in x-axis)

ii) $y = f(-x)$ ... multiply all x-values by -1
(graph will be reflected in y-axis).

21. a) $f(x) = \sqrt{x+2}$ reflection in y-axis is . $y = \sqrt{-x+2}$

D: $\{x \in \mathbb{R} \mid x \leq 2\}$, R: $\{y \in \mathbb{R} \mid y \geq 0\}$.

b) $f(x) = -2x+4$ reflected in x-axis is $y = -(-2x+4)$
$y = 2x-4$

D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R}\}$

c) $f(x) = x^2+6$ reflected in y-axis is $y = (-x)^2+6$
$y = x^2+6$

D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R} \mid y \geq 6\}$.

22. a) $f(x) = 3-2x$
$-f(x) = -(3-2x)$ ← reflection in x-axis
$= 2x-3$
$f(-x) = 3-2(-x)$ ← reflection in y-axis
$= 3+2x$

c) invariant point(s).
invariant points are x-int's $(\frac{3}{2}, 0)$
invariant points are y-int's $(0, 3)$.

~~23~~ Question	$f(x)$	$-f(x)$	$f(-x)$	$-f(x)$ invariant points (x-int's)	$f(-x)$ invariant points (y-int)
23.	$f(x) = x^2+6x$	$-f(x) = -(x^2+6x)$ $= -x^2-6x$	$f(-x) = (-x)^2+6(-x)$ $= x^2-6x$	$x(x+6)=0$ $x=0, x=-6$ $(0,0), (-6,0)$	$(0,0)$.
24.	$f(x) = x^2-4$	$-f(x) = -(x^2-4)$ $= -x^2+4$	$f(-x) = (-x)^2-4$ $= x^2-4$	$-(x-2)(x+2)=0$ $x=2$ or $x=-2$ $(2,0), (-2,0)$	$(0,4)$
25.	$f(x) = \sqrt{x}-4$	$-f(x) = -(\sqrt{x}-4)$ $= -\sqrt{x}+4$	$f(-x) = \sqrt{-x}+4$	$-\sqrt{x}+4=0$ $\sqrt{x}=4$ $x=16$ $(16,0)$	$(0,4)$
26.	$f(x) = \sqrt{x-5}$	$-f(x) = -\sqrt{x-5}$	$f(-x) = \sqrt{-x-5}$	$-\sqrt{x-5}=0$ $x=5$ $(5,0)$	none

Pg. 250 #27 – 39

27a) $y = 1.6x + 4$ (same y-int, sloping in opposite direction.).

b) $h =$ the y-int
$h = 4$ metres
∴ the height of the roof is 4 m.

c) find x-int.

$0 = -1.6x + 4$
$1.6x = 4$
$x = \frac{4}{1.6}$
$x = \frac{40}{16}$
$x = \frac{10}{4}$
$x = 2.5$

$w = 2x$
$w = 5$

∴ the width is 5 m.

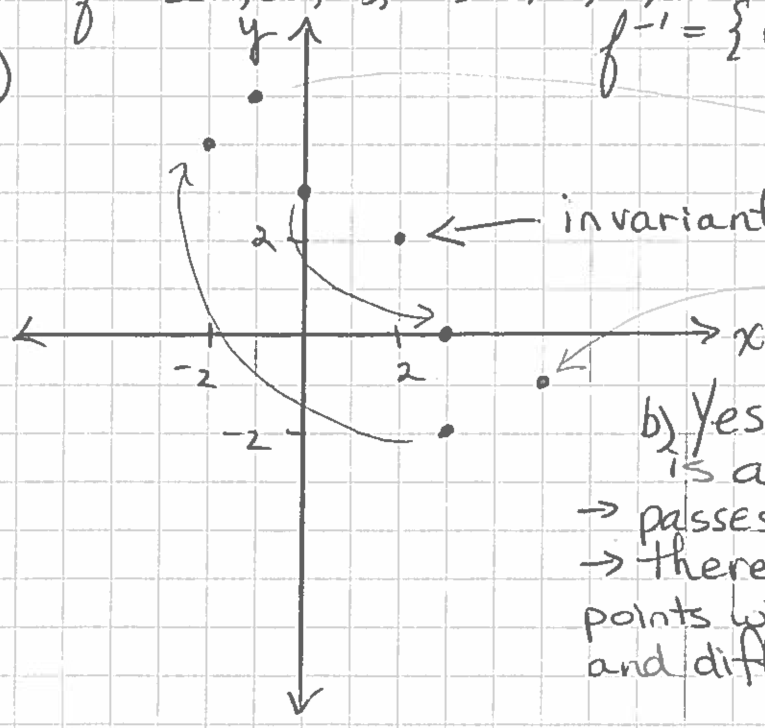
d) $y = -1.6x + 4$ D: $\{x \in \mathbb{R} \mid 0 \le x \le 2.5\}$
R: $\{y \in \mathbb{R} \mid 0 \le y \le 4\}$.

$y = 1.6x + 4$ D: $\{x \in \mathbb{R} \mid -2.5 \le x \le 2.5\}$
R: $\{y \in \mathbb{R} \mid 0 \le y \le 4\}$.

28. $f = \{(-1,5), (3,-2), (2,2), (0,3)\}$

$f^{-1} = \{(5,-1), (-2,3), (2,2), (3,0)\}$.

a)



b) Yes, the inverse is a function.
→ passes vertical line test
→ there are no two points with the same x-value and different y-values.

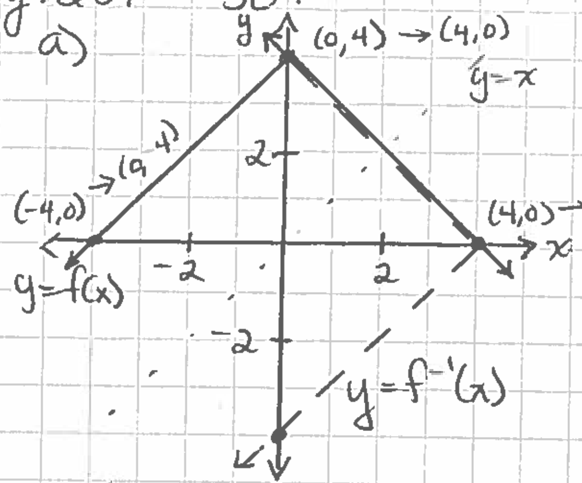
Pg. 250

#29.

	$f(x)$	$f^{-1}(x)$	D, R of $f(x)$	D, R of $f^{-1}(x)$
a)	$f(x) = x+7$	for $f^{-1}(x)$, $x = y+7$, $x-7 = y$, $f^{-1} = x-7$.	D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R}\}$	D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R}\}$.
b)	$f(x) = \frac{x-4}{3}$	for $f^{-1}(x)$ $x = \frac{y-4}{3}$, $3x = y-4$, $3x+4 = y$, $f^{-1}(x) = 3x+4$	D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R}\}$	D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R}\}$.
c)	$f(x) = 3x-1$	for $f^{-1}(x)$, $x = 3y-1$, $x+1 = 3y$, $y = \frac{x+1}{3}$, $f^{-1}(x) = \frac{x+1}{3}$	D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R}\}$	D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R}\}$.
d)	$f(x) = x^2-5$	for $f^{-1}(x)$, $x = y^2-5$, $x+5 = y^2$, $y = \pm\sqrt{x+5}$ $\boxed{f^{-1}(x) = \pm\sqrt{x+5}}$	D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R} \mid y \geq -5\}$	D: $\{x \in \mathbb{R} \mid x \geq -5\}$ R: $\{y \in \mathbb{R}\}$
e)	$f(x) = (x+2)^2$	for $f^{-1}(x)$, $x = (y+2)^2$, $\pm\sqrt{x} = y+2$, $\pm\sqrt{x} - 2 = y \Rightarrow \boxed{f^{-1}(x) = \pm\sqrt{x} - 2}$	D: $\{x \in \mathbb{R}\}$ R: $\{y \in \mathbb{R} \mid y \geq 0\}$	D: $\{x \in \mathbb{R} \mid x \geq 0\}$ R: $\{y \in \mathbb{R}\}$
f)	$f(x) = \sqrt{x-3}$, $\hookrightarrow x \geq 3$	for $f^{-1}(x)$, $x = \sqrt{y-3}$, $x \geq 0$, $x^2 = y-3$, $y = x^2+3$, $f^{-1}(x) = x^2+3$	D: $\{x \in \mathbb{R} \mid x \geq 3\}$ R: $\{y \in \mathbb{R} \mid y \geq 0\}$	D: $\{x \in \mathbb{R} \mid x \geq 0\}$ R: $\{y \in \mathbb{R} \mid y \geq 3\}$

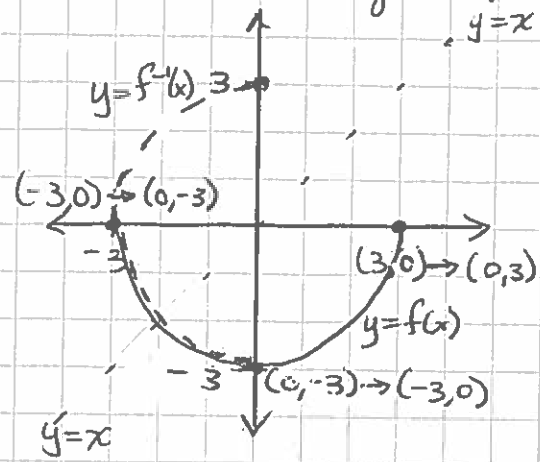
Pg. 251 # 30. —

a)



$f(x) \rightarrow$ solid line
$f^{-1}(x) \rightarrow$ dotted line

b)



#31. a) $y = 5x - 1 \longrightarrow$ for $f^{-1}(x)$,

$y = \frac{x+1}{5}$

$x = 5y - 1$

$x + 1 = 5y$

$y = \frac{x+1}{5}$ ✓

$\therefore f^{-1}(x) = \frac{x+1}{5}$ so the two functions are inverses of one another.

b) $y = 2x + 8 \rightarrow$ for $f^{-1}(x)$,

$y = 8 - \frac{1}{2}x$

$x = 2y + 8$

$x - 8 = 2y$

$y = \frac{x-8}{2}$

$y = \frac{1}{2}x - 4$

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

So the two functions are not inverses of one another.

#32. a) $f(x) = 3 - x^2$

for $f^{-1}(x)$,

$x = 3 - y^2$

$y^2 = 3 - x$

$y = \pm\sqrt{3-x}$

$\therefore f^{-1}(x) = \pm\sqrt{-(x-3)}$

reflected in y-axis; right 3.

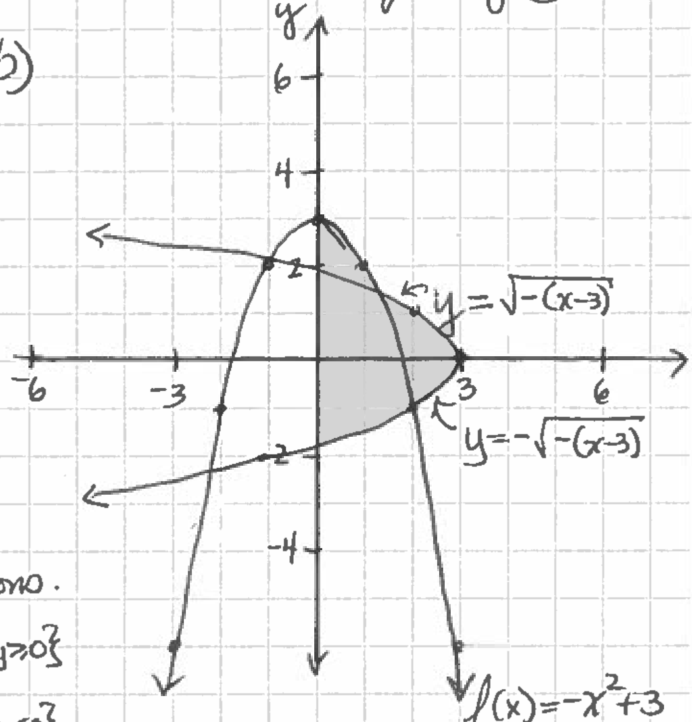
Separate into 2 functions.

$y = \sqrt{-(x-3)}$ $R = \{y \in \mathbb{R} \mid y \geq 0\}$

and

$y = -\sqrt{-(x-3)}$ $R = \{y \in \mathbb{R} \mid y \leq 0\}$.

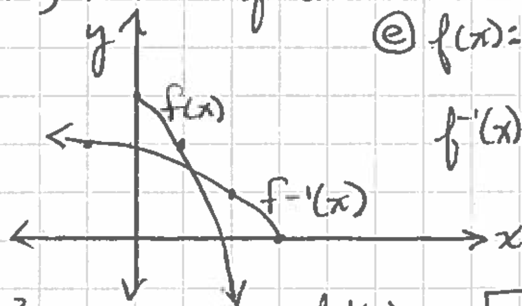
b)



c) if Domain of $f(x)$ is $\{x \in \mathbb{R} \mid x \geq 0\}$ then $f^{-1}(x)$ will be a function.

OR if $f(x)$ is $\{x \in \mathbb{R} \mid x \leq 0\}$ then $f^{-1}(x)$ will be a function.

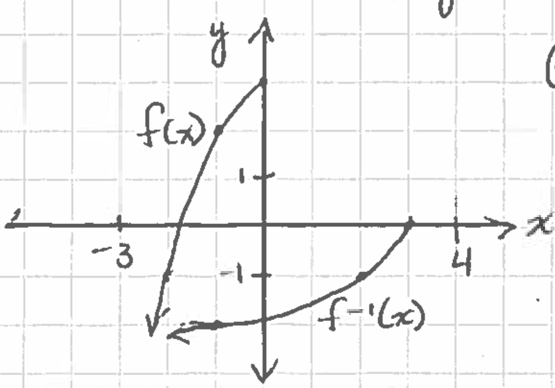
d) i) $f(x) = -x^2 + 3,\ x \geq 0 \Rightarrow f^{-1}(x) = \sqrt{-(x-3)}$



e) $f(x)$: D: $\{x \in \mathbb{R} \mid x \geq 0\}$
R: $\{y \in \mathbb{R} \mid y \leq 3\}$

$f^{-1}(x)$: D: $\{x \in \mathbb{R} \mid x \leq 3\}$
R: $\{y \in \mathbb{R} \mid y \geq 0\}$.

ii) $f(x) = -x^2 + 3,\ x \leq 0 \Rightarrow f^{-1}(x) = -\sqrt{-(x-3)}$



e) $f(x)$: D: $\{x \in \mathbb{R} \mid x \leq 0\}$
R: $\{y \in \mathbb{R} \mid y \leq 3\}$

$f^{-1}(x)$: D: $\{x \in \mathbb{R} \mid x \leq 3\}$
R: $\{y \in \mathbb{R} \mid y \leq 0\}$

Pg. 251

33. a) $f(x)=3x+2$

invariant points are when $y=x$.

set $f(x)=x$

$x=3x+2$

$-2x=2$

$x=-1$

notice $f(-1)=3(-1)+2$

$=-1$.

$\therefore$ invariant point $(-1,-1)$.

b) $f(x)=5x-8$

set $5x-8=x$

$4x=8$

$x=2$

notice

$f(2)=5(2)-8$

$=10-8$

$=2$

$\therefore$ invariant point is $(2,2)$.

34. a) Let $S be the sale price
Let $O be the original price

$S(O)=0.60O$

b) for $f^{-1}(x)$, $y=0.6x$

$x=0.6y$

$\frac{x}{0.6}=y$

$x \div \frac{6}{10}=y$

$x \times \frac{10}{6}=y$

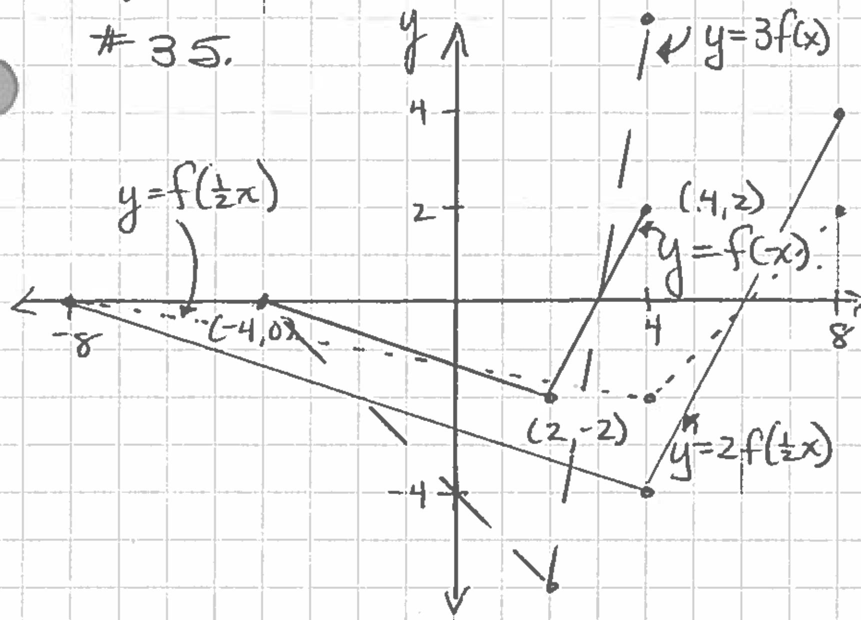
$y=\frac{5}{3}x$

$\therefore O(S)=\frac{5}{3}S$.

c) The inverse is original price as a function of the sale price

$\therefore$ The inverse finds the original price given the sale price.

#35.



a) $y = 3f(x)$ VS factor 3. (all y's × 3).

dotted lines.

b) $y = f(\frac{1}{2}x)$ HS factor 2. (all x's × 2)

small dotted line.

c) $y = 2f(\frac{1}{2}x)$ VS factor 2, HS factor 2

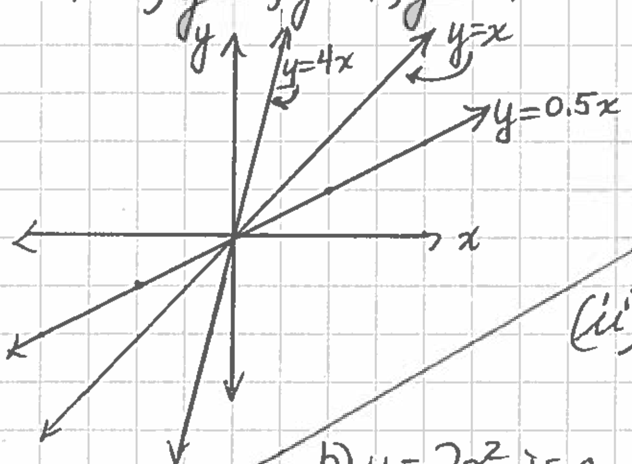
solid line

$y=3f(x)$: D: $\{x \in \mathbb{R} \mid -4 \le x \le 4\}$
R: $\{y \in \mathbb{R} \mid -6 \le y \le 6\}$

$y=f(\frac{1}{2}x)$: D: $\{x \in \mathbb{R} \mid -8 \le x \le 8\}$
R: $\{y \in \mathbb{R} \mid -2 \le y \le 2\}$

$y=2f(\frac{1}{2}x)$: D: $\{x \in \mathbb{R} \mid -8 \le x \le 8\}$
R: $\{y \in \mathbb{R} \mid -4 \le y \le 4\}$

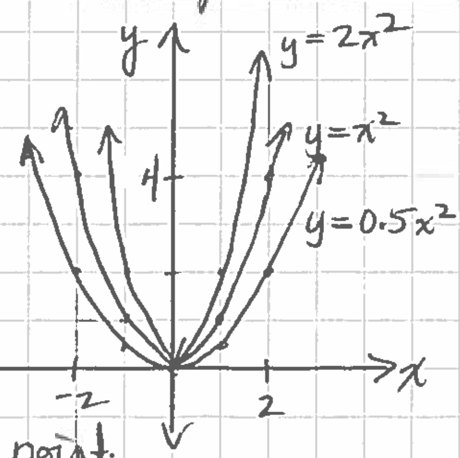
#36 i) $y=x$, $y=4x$, $y=0.5x$



b) $y=4x$ is VS factor 4 of $y=x$
$y=0.5x$ is VC factor ½ of $y=x$

c) (0,0) is the only invariant point

(ii)



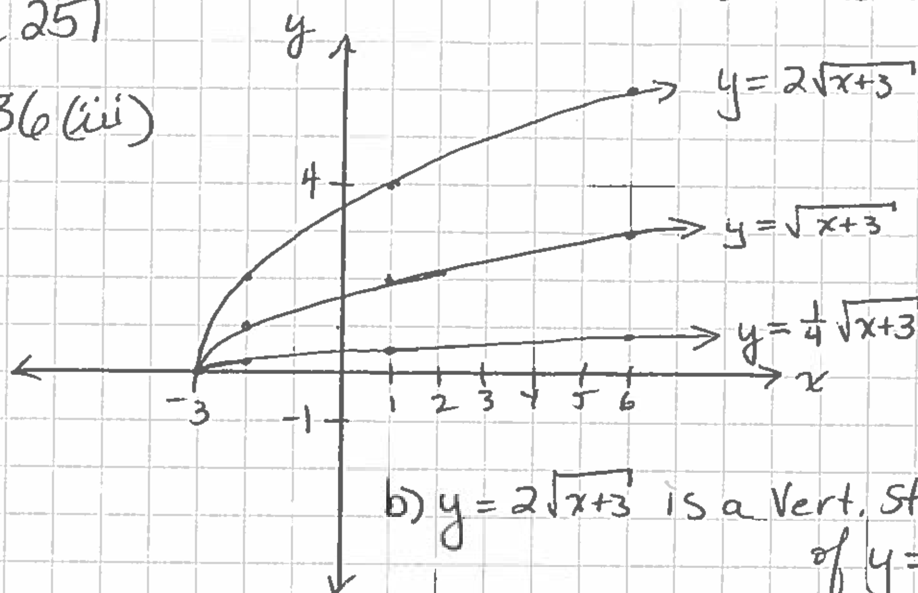
b) $y=2x^2$ is a Vertical Stretch factor 2 of $y=x^2$

$y=0.5x^2$ is a V Compression factor ½ of $y=x^2$

c) (0,0) is the only invariant point.

Pg 251

#36 (iii)



b) $y=2\sqrt{x+3}$ is a Vert. Stretch factor 2 of $y=\sqrt{x+3}$

$y=\frac{1}{4}\sqrt{x+3}$ is a Vert. Comp. factor $\frac{1}{4}$ of $y=\sqrt{x+3}$.

37. $f(x)=(x-6)(x+4)$ zeroes at $x=-4, 6$.

a) $y=2f(x)$ vertical stretch factor 2 ... will not change the zeroes

b) $y=f(2x)$ H. Compression by 2 OR Horizontal compression factor $\frac{1}{2}$ ... will change the zeroes ... all x's multiply by $\frac{1}{2}$
Zeroes are $(-2,0)$, $(3,0)$.

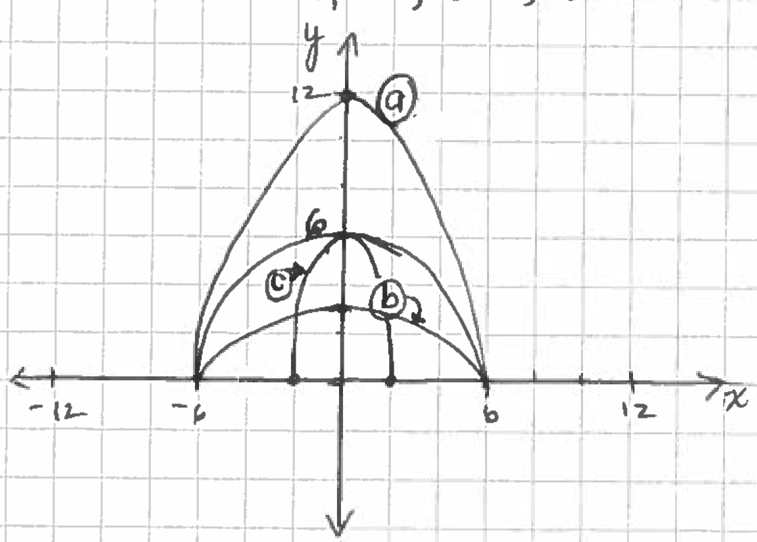
c) $y=f(0.5x)$ horizontal stretch factor 2 ... all x's multiply by 2
zeroes are $(-8,0)$, $(12,0)$.

38. $f(x)=\sqrt{36-x^2}$

a) $y=2f(x)$
$y=2\sqrt{36-x^2}$ VS 2.

b) $y=0.5f(x)$ VC $\frac{1}{2}$

c) $y=f(3x)$ HC $\frac{1}{3}$



Pg. 252

39. $y = f(x)$

a) $y = 4f(x)$

Vertical Stretch factor 4 $(y\text{'s} \times 4)$

b) $y = f(3x)$

Horizontal Compression factor $\frac{1}{3}$ $(x\text{'s} \times \frac{1}{3})$
(or Horizontal Compression by 2) or $x\text{'s} \div 3$

c) $y = \frac{1}{2} f(2x)$

Horizontal Compression factor $\frac{1}{2}$ $(x\text{'s} \times \frac{1}{2}$
(or Horizontal Compression by 2) or $x\text{'s} \div 2)$

Vertical Compression factor $\frac{1}{2}$ $(y\text{'s} \times \frac{1}{2})$

d) $y = 3f\left(\frac{1}{2}x\right)$

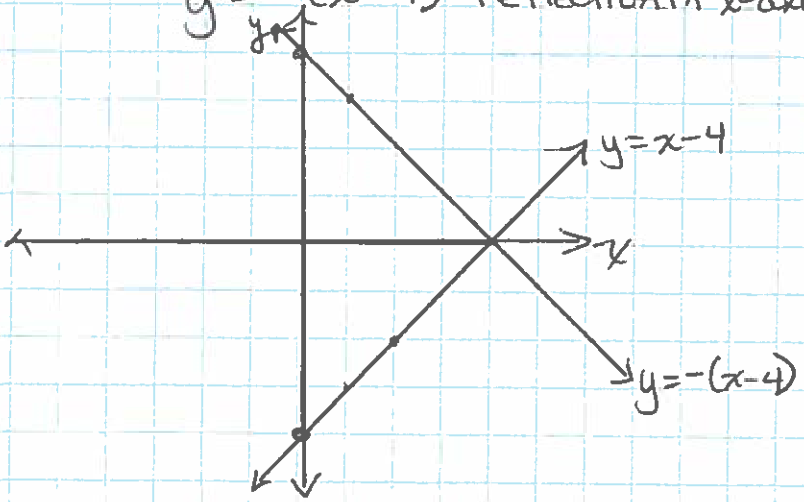
Horizontal Stretch factor 2 $(x\text{'s} \times 2)$

Vertical Stretch factor 3 $(y\text{'s} \times 3)$

Review
Pg. 252-253 #40-46

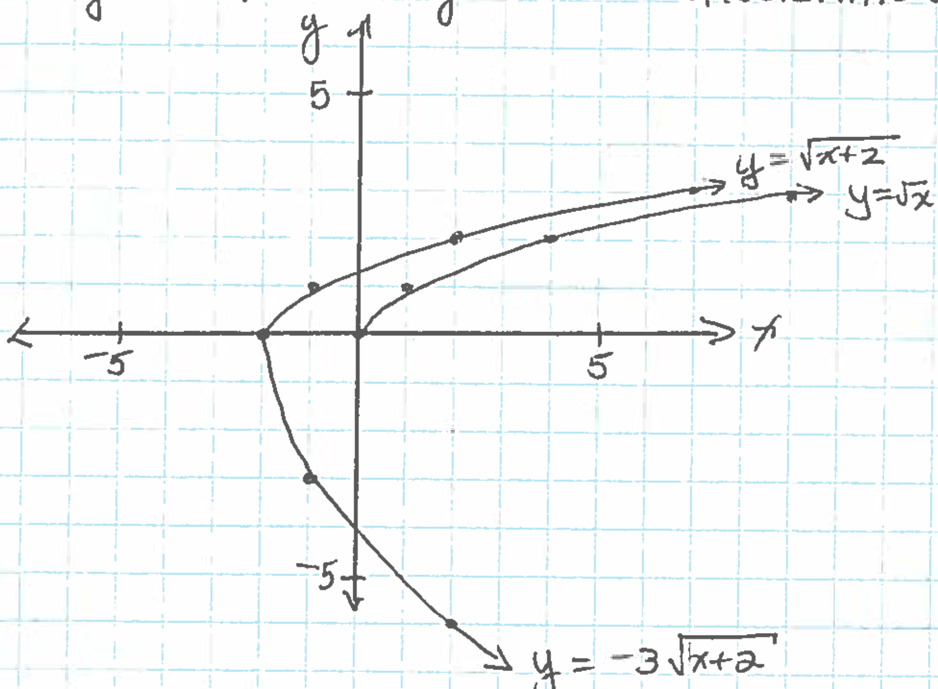
40 a) $y = x - 4$ $\quad m = 1, b = -4$

$y = -(x-4)$ reflection in x-axis



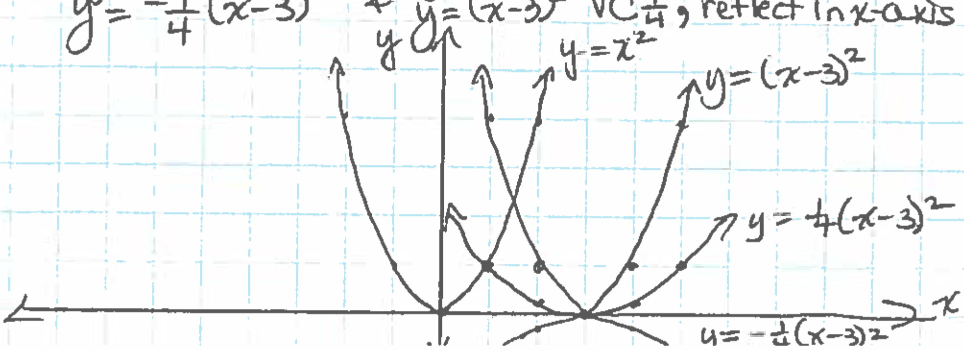
40 b) $y = \sqrt{x+2}$ $\quad y=\sqrt{x}$ sifted left 2

$y = -3\sqrt{x+2}$ $\quad y=\sqrt{x+2}$ < vertical stretch factor 3, reflected in x-axis



c) $y = (x-3)^2$ ← $y = x^2$ right 3

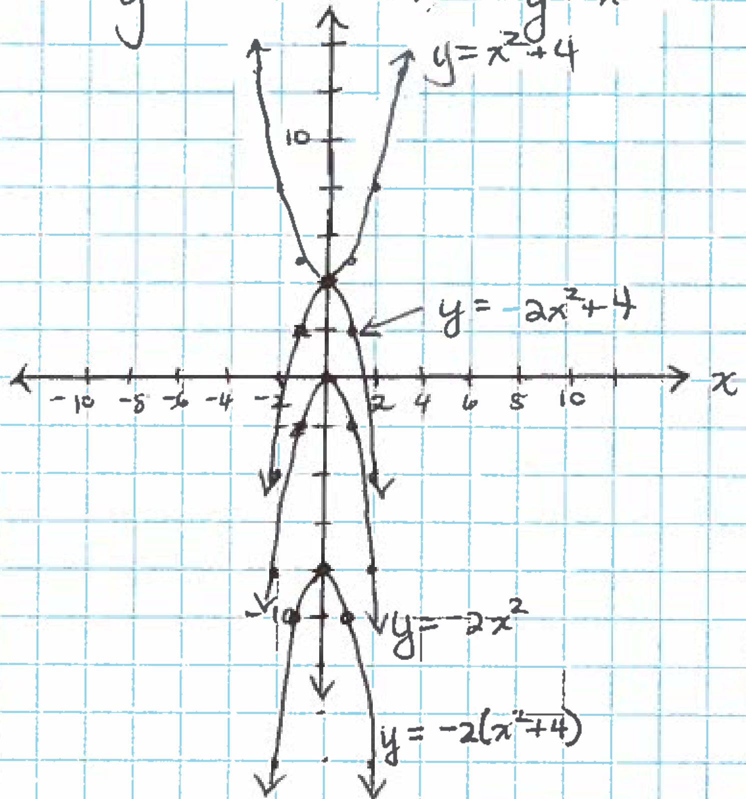
$y = -\frac{1}{4}(x-3)^2$ ← $y = (x-3)^2$ VC $\frac{1}{4}$, reflect in x-axis



40 d) $y = x^2 + 4$ $y = x^2$ up 4

$y = -2x^2 + 4$ $y = x^2$ VS factor 2, reflect in x-axis. shift up 4.

$y = -2(x^2+4)$ is reflect in x, VS Factor 2 $y = x^2 + 4$



41 a) $y = 3f(x+2) - 4$ ← vertical shift down 4

vertical stretch factor 3

horizontal shift left 2

b) $y = -2f(x) + 5$ ← vert. shift up 5

reflection in x-axis

vertical stretch factor 2.

c) $y = 0.5\ f(4x) + 2$ ← vertical shift up 2.

Vertical Compression factor $\frac{1}{2}$

Horizonal Compression factor $\frac{1}{4}$ (or Horizontal Compression by 4)

d) $y = f(2(x+1))$ ← horizontal shift left 1.

horizontal compression factor $\frac{1}{2}$

(or horizontal Compression by 2)

Pg. 253 # 41-46 U4Rev Pg Pg 15 of 20

41, e) $y = -f(0.5(x-3))+1$ ← vertical shift up 1.

horizontal shift right 3

reflection in x-axis

horizonal stretch factor 2.

f) $y = 3f(4-x)-7$

$y = 3f(-(x-4))-7$ ← shift down 7.

shift right 4

vertical stretch factor 3

reflection in y-axis

42. $f(x)=x^2$

a) $y = 2f(x+3)-4$

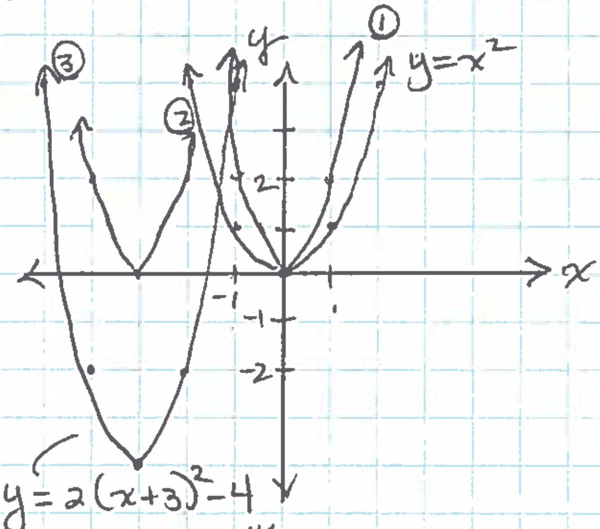
VS 2 ①

L 3 ②

D 4 ③

D: $\{x \in \mathbb{R}\}$

R: $\{y \in \mathbb{R} \mid y \geq -4\}$



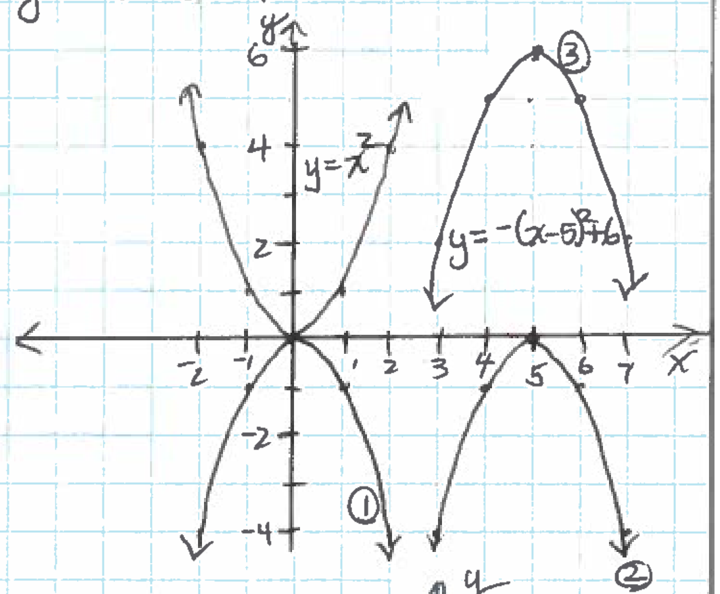
b) $y = -f(x-5)+6$ ← up 6 ③

reflect in x-axis ①

Right 5 ②

D: $\{x \in \mathbb{R}\}$

R: $\{y \in \mathbb{R} \mid y \leq 6\}$



c) $y = 0.5f(0.5(x+4))-3$ ← down 3 ④

Vert. Comp. $\frac{1}{2}$ ①

horizontal stretch 2. ②

left 4 ③

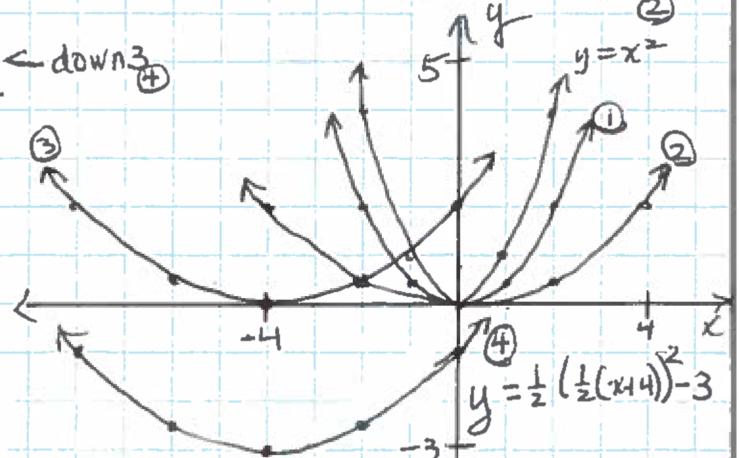
notice:

$y = \frac{1}{2}(\frac{1}{2}(x+4))^2-3$

$= \frac{1}{4}(\frac{1}{4})(x+4)^2-3$

$= \frac{1}{16}(x+4)^2-3.$

D: $\{x \in \mathbb{R}\}$, R: $\{y \in \mathbb{R} \mid y \geq -3\}$.



42d) $y = f(-0.5x+3)+2$

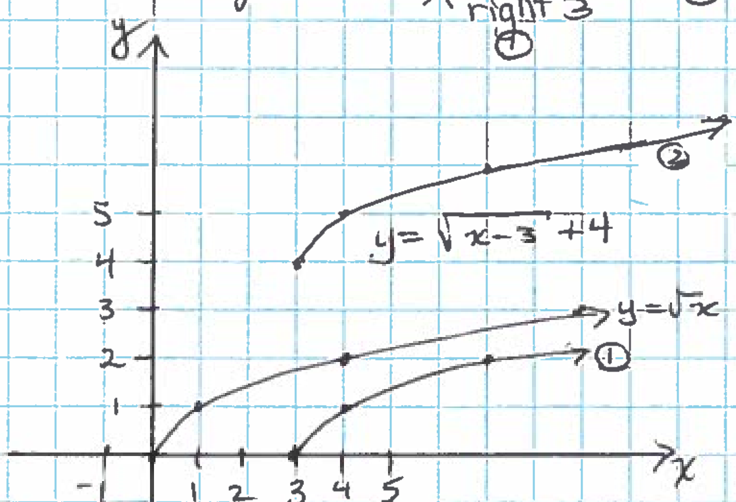
$y = f(-0.5(x-6))+2$ ← shift up 2 ④

reflect in y-axis ②; horiz stretch factor 2 ①; ↖ shift right 6 ③

D: $\{x \in \mathbb{R}\}$
R: $\{y \in \mathbb{R} \mid y \geq 2\}$.

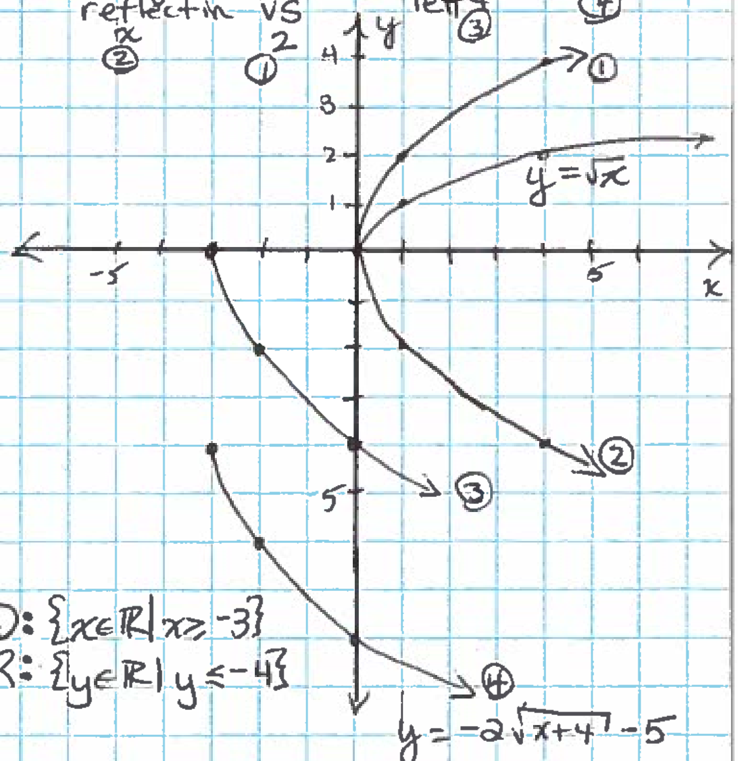
43. $f(x) = \sqrt{x}$

a) $y = f(x-3)+4$ ← up 4 ②
↑ right 3 ①



D: $\{x \in \mathbb{R} \mid x \geq 3\}$
R: $\{y \in \mathbb{R} \mid y \geq 4\}$

b) $y = -2f(x+4)-5$ ↖ down 5 ④
reflect in x ②; VS 2 ①; ↑ left 4 ③



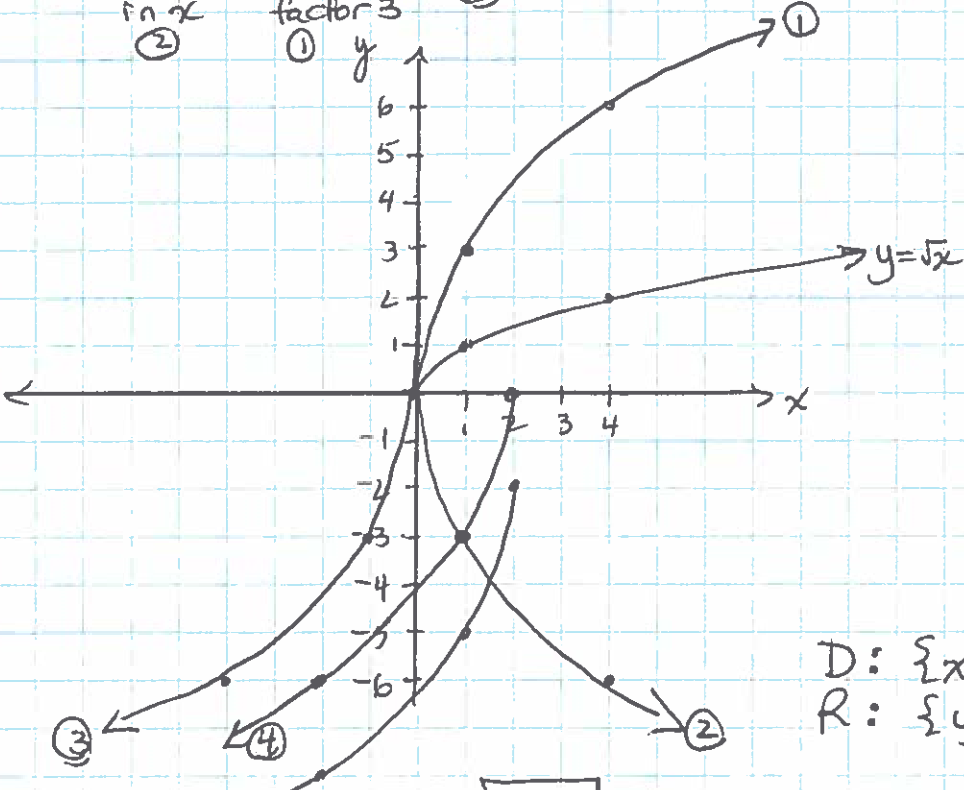
D: $\{x \in \mathbb{R} \mid x \geq -3\}$
R: $\{y \in \mathbb{R} \mid y \leq -4\}$

Pg. 253 # 43-46 U4 Rev pg. 17 & 20

43 c) $y = -3f(2-x)-2$

$y = -3(-(x-2))-2$ ← down 2 (5)

reflect in x (2) VS factor 3 (1) reflect in y (3) shift right 2 (4)



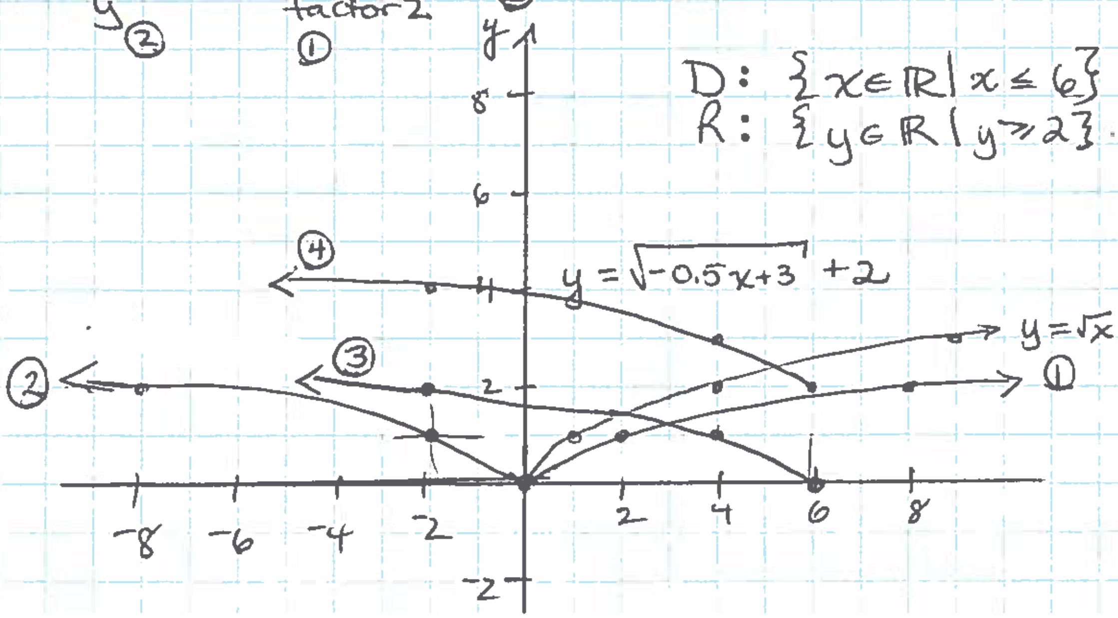
(5) $y = -3\sqrt{2-x} - 2$

D: $\{x \in \mathbb{R} \mid x \le 2\}$
R: $\{y \in \mathbb{R} \mid y \le -2\}$.

d) $y = f(-0.5x+3)+2$

$y = f(-\frac{1}{2}(x-6))+2$ — up 2 (4)

reflect in y (2) H stretch factor 2 (1) right 6 (3)



D: $\{x \in \mathbb{R} \mid x \le 6\}$
R: $\{y \in \mathbb{R} \mid y \ge 2\}$.

Pg. 253 #44-46

44. $y=\sqrt{x}$ VS 4, reflect in y, 5 Left, 4 up
① ② ③ ④

① $y=4\sqrt{x}$

② $y=4\sqrt{-x}$

③ $y=4\sqrt{-(x+5)}$

④ $\boxed{y=4\sqrt{-(x+5)}+4}$

45. $f(x)=\sqrt{16-x^2}$

a) $y=3f(x)-4$

$y=3\sqrt{16-x^2}-4$

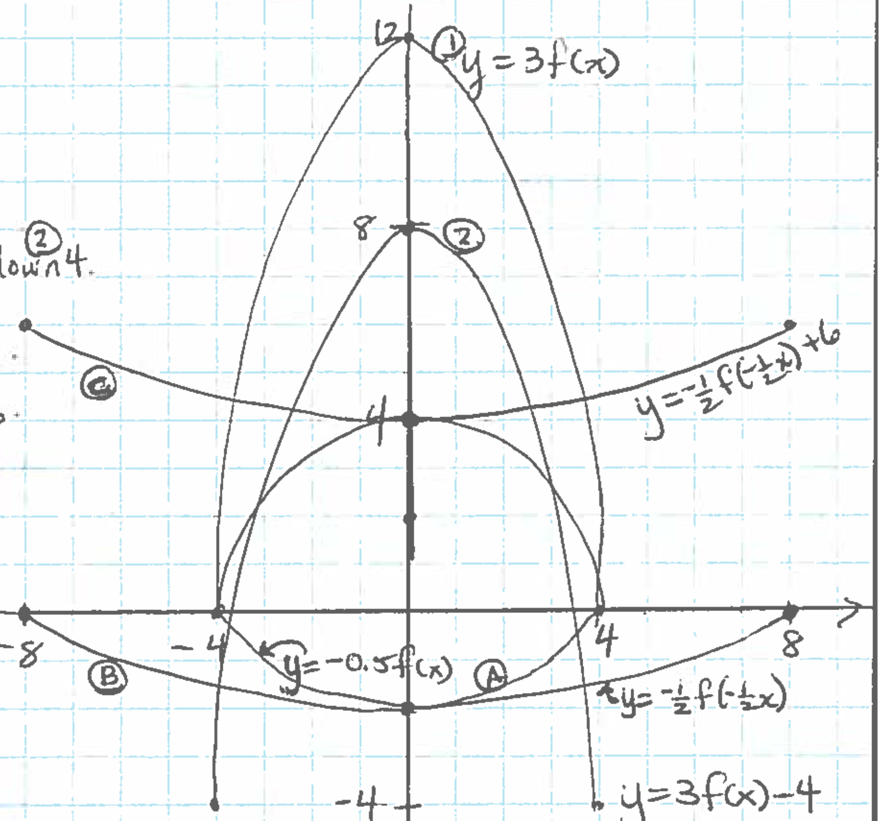
V. stretch 3 ① — shift down 4 ②

b) $y=-0.5f(-0.5x)+6$

reflect x, VC $\frac{1}{2}$ — Ⓐ Ⓐ done together.

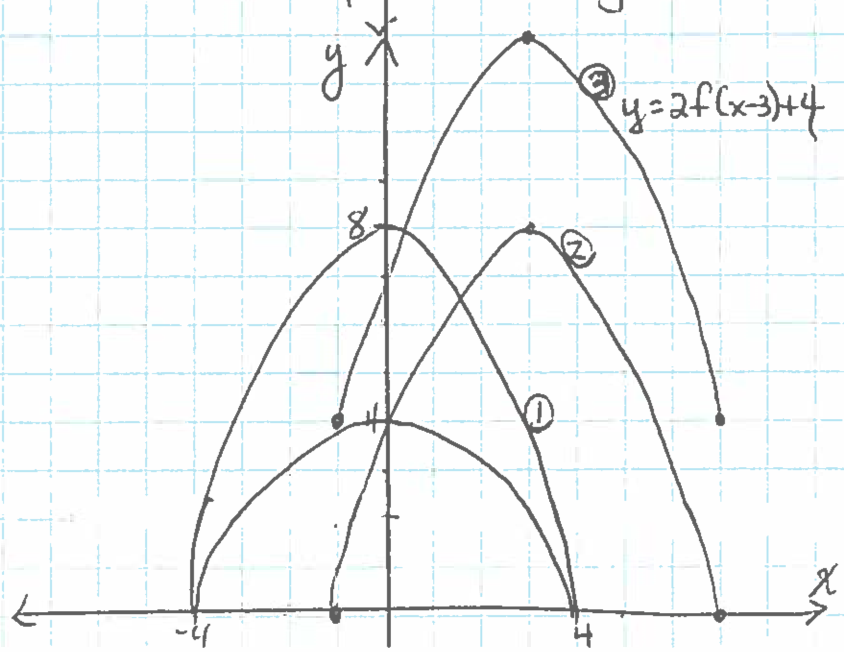
reflect y, HS 2 Ⓑ

up 6 Ⓒ



c) $y=2f(x-3)+4$

VS 2 ①, R 3 ②, U 4 ③



Pg. 253 # 46

Oops! only 19 pgs. total

46 a) $N = 1.06S + 2000$

b) Yes, if \$2000 raise is first then

$N = 1.06(S + 2000)$.