Linear Relations - Solutions

4.1 Patterns, page 123

1. **a)** 9 **b)** 15 **c)** 33 **d)** 51 **e)** -18 **f)** $3x + 6$

2. **a)** 14 **b)** 34 **c)** 70 **d)** 90 **e)** 162 **f)** $4x - 6$

3. **a)** 3 **b)** 4 **c)** 3 **d)** -5 **e)** -6 **f)** 5 **g)** $\sqrt{2}$ **h)** $-\sqrt{3}$

4. **a)** 14, 17, 20 **b)** 22, 26, 30 **c)** 8, 11, 14 **d)** $-5, -10, -15$ **e)** $-29, -35, -41$ **f)** 12, 17, 22

g) $-1, -4, -7$ **h)** $-2.9, -2.5, -2.1$

5. **a)** $t = 3n - 1$ **b)** $t = 4n + 2$ **c)** $t = 3n - 7$ **d)** $t = -5n + 20$ **e)** $t = -6n + 1$ **f)** $t = \frac{n+1}{2}$

6. **a)** 149 **b)** 202 **c)** 143 **d)** -230 **e)** -299 **f)** $24\frac{1}{2}$

7. **a)** 21 **b)** 31 **c)** 41 **d)** 51

8. **a)** $\frac{500 - 300}{100 - 0} = 2$, when $t = 0$, $c = 300$, therefore $C = 2n + 300$

b) $C = 2n + 300 \rightarrow C = 2(650) + 300 = \$1600$

9. **a)** $C = 0.2n + 50$ **b)** $C = 0.2(480) + 50 = \$146$

10. **a)** $\frac{300 - 260}{15 - 10} = 8$; Each student pays \$8 **b)** 10 players pay \$80; \$260 − \$80 = \$180 entrance fee

11. **a)** let $y =$ graduation year, $x =$ years spent in university; $\frac{45 - 41}{1994 - 2000} = -\frac{2}{3}$, therefore $y = -\frac{2}{3}x + 45$

b) 2012 is 18 years from 1994; $y = -\frac{2}{3}(18) + 45 = 33\%$

12. Each number is the sum of the previous two numbers, therefore 21, 34, 55, 89, 144.

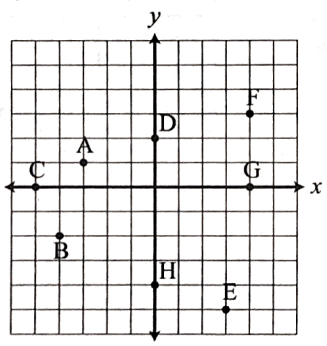
4.2 Linear Systems, page 129

1. **a)** $>, >$ **b)** $<, >$ **c)** $<, <$ **d)** $>, <$

2. **a)** I, III **b)** II, IV

3. **a)** IV **b)** I **c)** II **d)** III

4.



5. A (0, 0) B (4, 5) C (5, 0) D (3, − 6) E (0, − 3) F (− 3, − 4) G (− 3, 0) H (− 5.5. 2) I (0, 3)

6. **a)** yes **b)** no **c)** yes **d)** yes **e)** yes **f)** yes

7. **a)**

x	y
0	2
$\frac{8}{3}$	0
4	−1

b)

x	y
0	−6
2	0
4	6

c)

x	y
0	$-\frac{5}{2}$
$-\frac{10}{3}$	0
−6	2

d)

x	y
0	−8
3	0
$\frac{9}{2}$	4

e)

x	y
0	0
0	0
−3	6

f)

x	y
−3	−2
0	−2
4	−2

8. **a)**

x	y
0	1
−1	0
5	6

y-int = 1 **b)**

x	y
0	−2
$\frac{2}{3}$	0
2	4

y-int = − 2 **c)**

x	y
0	1
3	−5
−2	5

y-int = 1 **d)**

x	y
0	2
3	−3
−3	7

y-int = 2

e)

x	y
0	2
−6	0
6	4

y-int = 2 **f)**

x	y
0	−1
6	2
−6	−4

y-int = − 1 **g)**

x	y
0	1
2	4
−4	−5

y-int = 1 **h)**

x	y
0	2
4	0
−4	2

y-int = 2

9. **a)** $y = \frac{1}{3}x$ **b)** $y = -2x$ **c)** $y = \frac{1}{3}x + 2$ **d)** $y = \frac{2}{3}x + 1$ **e)** $y = -\frac{2}{3}x + 2$

f) $y = \frac{5}{2}x - \frac{1}{2}$ **g)** $y = -\frac{1}{4}x + \frac{3}{2}$ **h)** $y = \frac{3}{8}x - \frac{5}{2}$

10. **a)** \$ 600, \$ 400, \$ 200 **b)** \$ 250

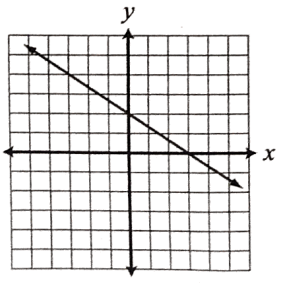
11. **a)** 25.2, 25.6, 26 **b)** 27.6 liters

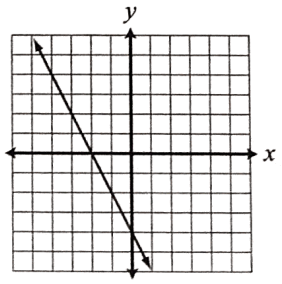
12. **a)** \$ 260, \$ 420, \$ 740 **b)** \$ 580

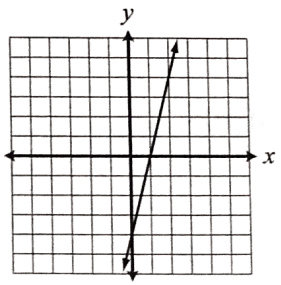
13. **a)** 22.4°, 17.6°, 15.2° **b)** 25°

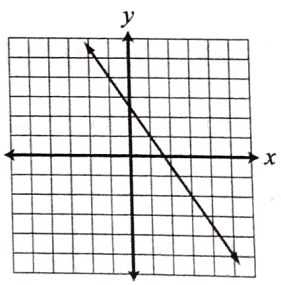
4.3 Graphing Equations In The Form $Ax + By = C$, page 137

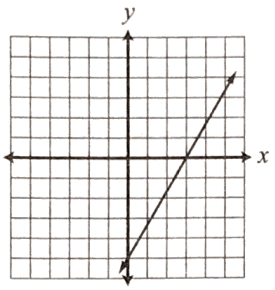
1. **a)** yes **b)** yes **c)** no **d)** no **e)** yes **f)** no

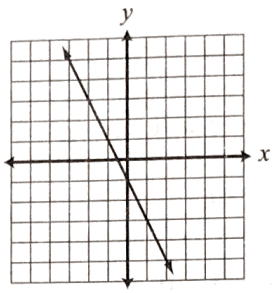
2. **a)** 

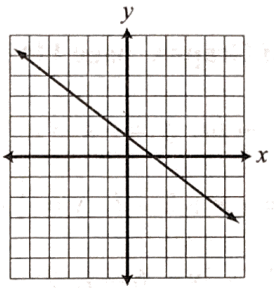
b) 

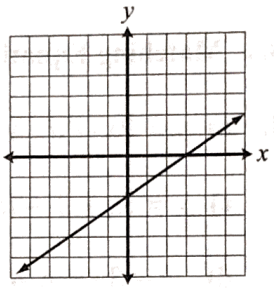
c) 

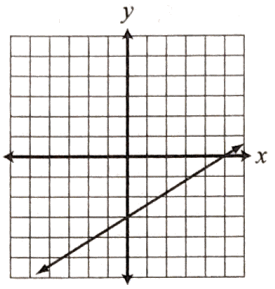
d) 

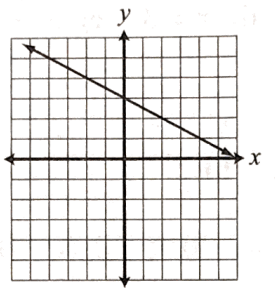
2. e) 

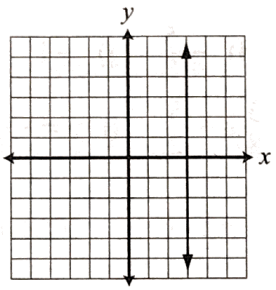
f) 

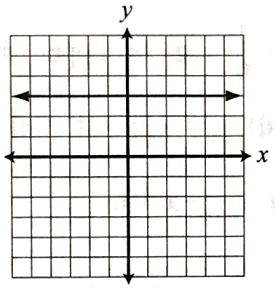
g) 

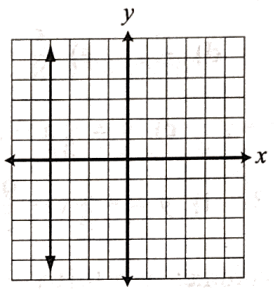
h) 

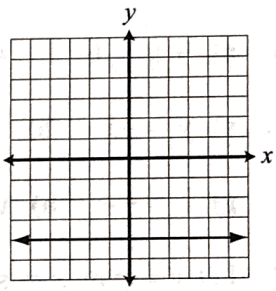
i) 

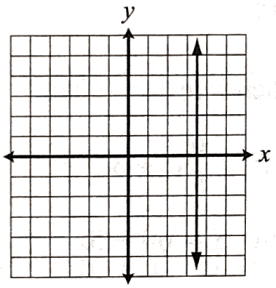
j) 

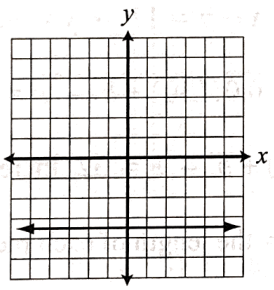
3. a) 

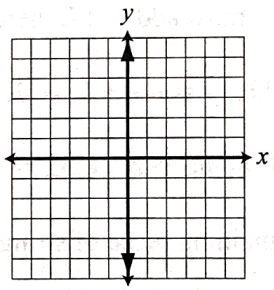
b) 

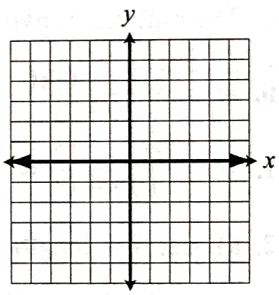
c) 

d) 

e) 

f) 

g) 

h) 

4. a)

x	y
-2	-3
-1	-1
0	1
1	3
2	5

b)

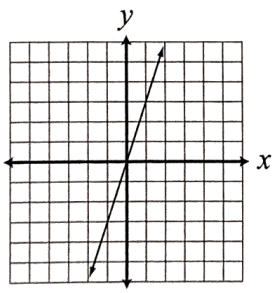
x	y
-6	2
-2	0
0	-1
4	-3
6	-4

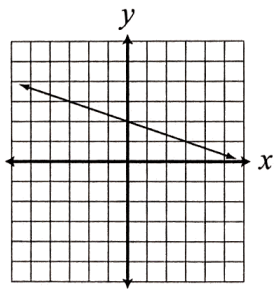
c)

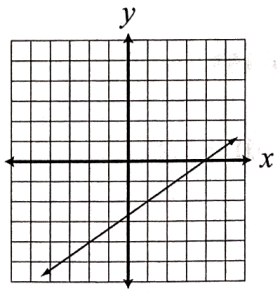
x	y
-6	-3
-3	-1
0	1
3	3
6	5

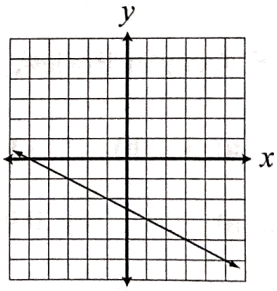
d)

x	y
-6	6
-4	3
-2	0
0	-3
2	-6

5. a) 

b) 

c) 

d) 

4.4 Matching Equations of Graphs, page 144

1. **a)** $y = 2x \rightarrow ii$, $y = \frac{1}{2}x \rightarrow iii$, $y = -x \rightarrow i$ **b)** $y = x \rightarrow ii$, $y = x + 3 \rightarrow i$, $y = x - 3 \rightarrow iii$

c) $y = 3x + 2 \rightarrow ii$, $y = -x + 2 \rightarrow i$, $y = \frac{1}{3}x + 2 \rightarrow iii$

d) $2x - 3y = 6 \rightarrow iii$, $2x + 3y = 6 \rightarrow i$, $2x - 3y = -6 \rightarrow ii$

2. **a)** $2x + 3y = 6$ **b)** $2x - y = -4$ **c)** $y = 2$ **d)** $x = 3$ **e)** $3x - 2y = -6$ **f)** $3x - 5y = 15$

g) $x - 2y = 5$ **h)** $5x + 2y = -5$

3. **a)** *ii* **b)** *ii* **c)** *i* **d)** *ii* **e)** *ii* **f)** *iii* **g)** *iii* **h)** *ii*

4. **a)** *iv* **b)** *x* **c)** *vii* **d)** *v* **e)** *i* **f)** *vi* **g)** *iii* **h)** *ii* **i)** *ix* **j)** *viii*

5. **a)** 0 **b)** 2 **c)** -3 **d)** 1 **e)** 2.5 **f)** 0 **g)** no y-intercept **h)** -3 **i)** -4.5 **j)** 6

6. **a)** -1 **b)** 1 **c)** $\frac{1}{5}$ **d)** -2 **e)** $\frac{5}{8}$ **f)** $-\frac{1}{6}$ **g)** no slope **h)** 0 **i)** $-\frac{5}{3}$ **j)** -1

7. **a)** $y = -x$ **b)** $y = x + 2$ **c)** $y = \frac{1}{5}x - 3$ **d)** $y = -2x + 1$ **e)** $y = \frac{5}{8}x + \frac{5}{2}$ **f)** $y = -\frac{1}{6}x$

g) $x = -4$ **h)** $x = -3$ **i)** $y = -\frac{5}{3}x - \frac{9}{2}$ **j)** $y = -x + 6$

8. Let $y =$ pay, $x =$ sales volume; $y = 0.10x + 750$

9. The ranking of two teams must add to 17, therefore $x + y = 17 \rightarrow y = -x + 17$

10. $m = \frac{1.50 - 0.40}{30 - 8} = 0.05$; $y = mx + b \rightarrow 1.50 = 0.05(30) + b \rightarrow b = 0$, therefore $y = 0.05x$

11. $m = \frac{212 - 32}{100 - 0} = \frac{9}{5}$; $F = mC + b \rightarrow 32 = \frac{9}{5}(0) + b \rightarrow b = 32$, therefore $F = \frac{9}{5}C + 32°$

12. **a)** Let $S =$ length of remaining piece of string, $x =$ the length of each piece cut. $S = 60 - 5x$

b)

x	0	3	6	9	12
S	60	45	30	15	0

c) From the table, the string is cut into 5 pieces 12 cm long with no piece left over.

d) $S = 60 - 5x = 5 \rightarrow -5x = -55 \rightarrow x = 11$

The string is cut into 5 pieces 11 cm long with a 5 cm piece left over.

4.5 Chapter Review, page 153

1. **a)** 3 **b)** -3 **c)** $\frac{1}{4}$ **d)** -1.2

2. **a)** -285 **b)** 389

3. **a)** $t = 15 - 3n$ **b)** $t = 4n - 11$

4. $1800

5. $V = -0.15(12\,000x) + 17\,000 = 0 \rightarrow x = 6$ years, 8 months

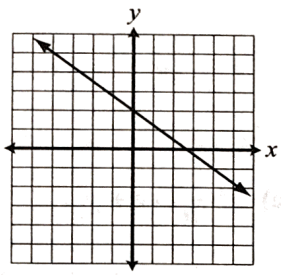
6. a)

x	y
0	−4
6	0
−3	−6

b)

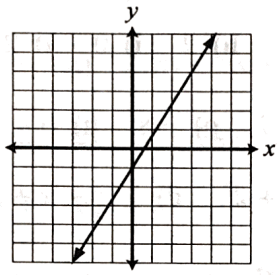
x	y
0	2
$\frac{3}{2}$	0
−3	6

7. a)



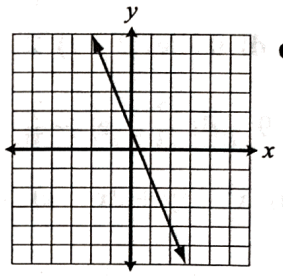
y-intercept = 2

b)



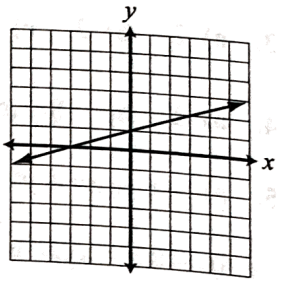
y-intercept = − 1

c)



y-intercept = 1

d)

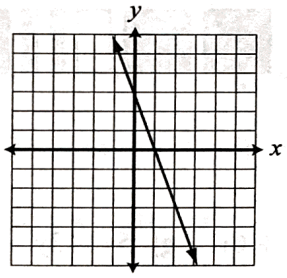


y-intercept = 1

8. a) $y = -\frac{2}{3}x + 1$ **b)** $y = \frac{1}{4}x + 2$ **c)** $y = -2x - 2$ **d)** $y = \frac{2}{3}x + \frac{5}{3}$

9. b) $705 **c)** 55 days

10. a)



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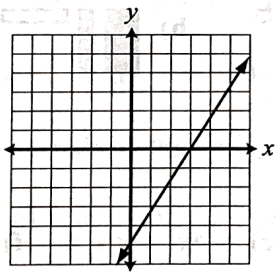
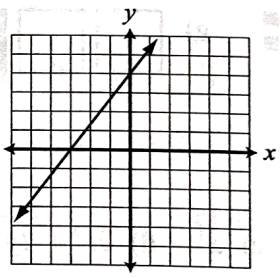
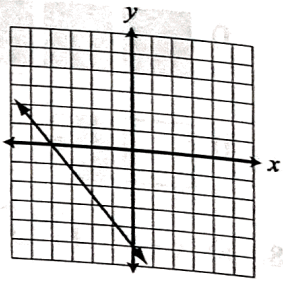


c)



d)



11. a) *v* **b)** *viii* **c)** *vi* **d)** *ii* **e)** *iv* **f)** *i* **g)** *iii* **h)** *vii* **i)** *x* **j)** *ix*