Chapter 1 Homework Answers for Darken and Ligare, Math 161

1. (a) $49  
   (b) $183  
   (c) $34 gain  
   (d) $66 loss  
   (e) $120 loss

2. (a) $40  
   (b) 7  
   (c) $5  
   (d) 3  
   (e) $1250  
   (f) Day 3, $1000

3.

4.

5. (a) $65  
   (b) 7  
   (c) $30  
   (d) 1  
   (e) $500  
   (f) Buy on Day 3 for the greatest profit, $750.

6. (a) i) $600  
   (b) i) 10  
   (ii) $80  
   (iii) $700  
   (iv) $100  
   (v) A  
   (vi) $700  
   (vii) $750  
   (viii) $750  
   (v) B

7. One possible example:
8. For the upper graph: The walker starts at Mile Marker 0 at time 0, proceeds at the rate of 4 mph for 3 hours, arriving a Mile Marker 12, then reverses direction and moves at the rate of 7/3 mph for 3 hours, arriving at Mile Marker 5 at Hour 6.
For the lower graph: The traveler starts at Mile Marker 40 at time 0 and moves toward the lower numbers at the rate of 10 mph for 4 hours, arriving at Mile Marker 0 at Hour 4, then reverses direction and moves at the rate of 5 mph for 4 hours, arriving at Mile Marker 20 at Hour 8.

9. (a) 8 mph
   (b) Any line segment that starts at (0, 2) and has slope greater than 8,
   so that it reaches a point with second coordinate 12 before $x = 1.25$
   (which is the time the first runner reaches that value). An example:

10. The lines on the graph didn’t appear properly in the text. It should have looked like this:

   (a) It would be more jagged (have more ups and downs).
   (b) 2
   (c) April, May, June, October, November, December
   (d) February, March, July, August, September (January unknown)
(e) Buy at the end of August.
(f) Your loss would be greatest if you bought at the end of June.

12. Left to right the slopes are 8/3, 0, -1.

13. (a) east  (c) west to east  (e) east to west  (b) -2 mph  (d) 2 mph

(f) i) Christine, ii) 0.5 hours  iii) 0.5 hours  iv) Mile Marker 2
(g) They pass after they have each been walking 1.5 hours
(h) They pass at position 2.5 miles.

14. The points in part (a) lie on a line, since no matter which two you take you get the same slope, 3 (so the line through the first and third, for example, must go through the second). The same reasoning applies to the sets of points in (b) and (d), but not (c).

15. a) 25  b) 0

16. The slope of Line t is -2, of Line s is -1/2, of Line u is 1, of Line r is 2.

17. The slopes are the same as in 16.

18. The order of the slopes is the same as in 16, but the slopes are all halved.

19. (a) 6  (c) 4  (e) -1  (g) 1  (b) -4  (d) 13/3  (f) -2  (h) 1

20. (a) $y = \frac{3}{5}x$
(b) $y = 2$
(c) $y = \frac{4}{3}x - 3$
(d) $x = 0$ (The language is iffy here: it’s not customary to speak of the $y$-axis, which this is, as having a $y$-intercept.)
(e) $y = -2.5$
(f) $x = 0$

21. (a) Travel at a rate of 1/5 meters/second for 20 seconds, starting at Position 0.
(b) Stand still for 10 seconds at Position 2, then move at a rate of 1/5 meters/second for 10 seconds.
(c) Start at Position 2, move at a rate of 1/5 meters/second for 10 seconds, then reverse direction and move at the rate of -2/5 meters/second for 10 seconds.

22. Let the slope be $m$ and the $y$-intercept be $b$.

(a)
\[
\begin{align*}
(\text{a}) & \quad m = 8, \quad b = -16 \\
(\text{b}) & \quad m = -2, \quad b = 6 \\
(\text{c}) & \quad m = 2, \quad b = -1/3 \\
(\text{d}) & \quad m = 2/3, \quad b = -4 \\
(\text{e}) & \quad m = -1/2, \quad b = 0 \\
(\text{f}) & \quad m = -2, \quad b = -6 \\
(\text{g}) & \quad m = 2, \quad b = 5 \\
(\text{h}) & \quad m = -7, \quad b = 44 \\
(\text{i}) & \quad m = 1/3, \text{ any value for } b \\
(\text{j}) & \quad m = 2/7, \text{ any value for } b.
\end{align*}
\]

23. To find the \(x\)-intercept, set \(y = 0\) in the equation and solve for \(x\).

\[
\begin{align*}
(\text{a}) & \quad 2 \\
(\text{b}) & \quad 3 \\
(\text{c}) & \quad 1/6 \\
(\text{d}) & \quad 6 \\
(\text{e}) & \quad 0 \\
(\text{f}) & \quad 3 \\
(\text{g}) & \quad -5/2 \\
(\text{h}) & \quad 44/7
\end{align*}
\]

(i) cannot be determined from the information given

(j) cannot be determined from the information given

24. a, 5; b, 4; c, 1; d, 3; e, 2; f, 6; g, 7; h, 8; i, 9; j, 10

25. \(N, -1/2; P, -1/5; L, 1/2; M, 1\)

26. The equations are:

\[
\begin{align*}
(\text{a}) & \quad y = -2 \\
(\text{b}) & \quad y = 5 \\
(\text{c}) & \quad y = 3 \\
(\text{d}) & \quad y = -9 \\
(\text{e}) & \quad y = 0 \\
(\text{f}) & \quad y = 5 \\
(\text{g}) & \quad y = 207
\end{align*}
\]

27. Each of the graphs for parts a, b, c, d, e and f is shown below. They can be identified by their \(y\)-intercepts. For parts a and f the line is the same. The graph for part g is not shown on this coordinate system, since if it were included the scale would be so small it would be difficult or impossible to distinguish the others. But it too would be a horizontal line.
28. The equations are:

(a) \[ x = 6x = -1 \]
(b) \[ x = 8 \]
(c) \[ x = 4 \]
(d) \[ x = 5 \]
(e) \[ x = 0 \]
(f) \[ x = 101 \]

29. As in Exercise 27, the lines can be identified by their intercepts, and the last line is not shown because of the effect it would have on the scale.

30. Two parallel lines have the same slope (or lack of slope), so the easiest way to do this exercise for the cases in which the equation is in the form \( y = mx + b \) is to plug the given point into \( y = mx + b \) using the value given for the slope \( m \) and solve for \( b \). When the equation is not in that form, find the slope.

(a) \( y = 3x + 1 \)
(b) \( y = \frac{1}{2}x - 5 \)
(c) \( y = -x \) (This one is the given line.)
(d) \( y = \frac{2}{3}x \)
(e) \( y = 0 \)
(f) \( x = 0 \)

31. In parts (e) and (f) one of the two lines lies on an axis, so only the other line shows separately. \((2/3)x\)
32. (First find the slope of the original line.)

(a) \( y = -\frac{1}{3}x + \frac{23}{3} \)  
(b) \( y = -2x + 15 \)  
(c) \( y = x \)  
(d) \( y = -\frac{3}{2}x \)  
(e) \( x = 0 \)  
(f) \( y = 0 \)

33.

\[ a) \ y = 4x + 2 \quad b) \ y = 5x - 5 \]

The three points in (c) do not lie on a line: the first two lie on the \( y \)-axis and the third does not.

The three points in (d) do not lie on a line: the slope of the line through the first two is 2 and the slope of the line through the first and third is \( \frac{2}{3} \).

\[ e) \ y = \frac{1}{3}x \quad f) \ y = 2x \quad g) \ y = 3x - 5 \]

In (h), since \( x = 3 \) is vertical and \( y = 1 \) is horizontal, any horizontal line is perpendicular to the first and parallel to the second, so any line of the form \( y = a \), where \( a \) is a constant, satisfies this description.

In (i), there is no such line, since the \( y \)-axis and \( y = 2 \) are perpendicular to each other, so any line parallel to one would be perpendicular, not parallel, to the other.
In (l), a line perpendicular to \( y = x \) has slope \(-1\), and a line perpendicular to \( y = -3x + 1 \) has slope \( \frac{1}{3} \), so no line is perpendicular to both.

The description in (m) is impossible: if a line has the same intercepts as a given line, it is the given line.

In (n), the intersection of the two lines given is \( \left( \frac{1}{4}, -\frac{1}{2} \right) \), and any line through this point satisfies the description. Such a line satisfies the equation

\[
\frac{y + \frac{1}{2}}{x - \frac{1}{2}} = m
\]

for any \( m \) of your choice, or is vertical. Simplest choices are \( m = 0 \), giving the line \( y = -\frac{1}{2} \), and vertical—\( x = \frac{1}{4} \).

In (o), find the two points of intersection, \( (2, 1) \) and \( \left( \frac{8}{5}, \frac{1}{5} \right) \), and find the line through those two points: \( y = -\frac{1}{5}x + \frac{5}{3} \).

In (p) the line has slope 5. Use either point to find the equation: \( y = 5x - 5a \).

In (q), \( y = p = 8(x - b) \), or any equivalent equation.

In (r), \( y - b = a \left( x - \frac{a}{b} \right) \) or any equivalent equation.

34. a) M, L, N
   b) a) s, q, p, r (not including the axes)
   c) p, k, j, m, n