Concept and Vocabulary:

1. The slope, m, of the line through the distinct points (x_1, y_1) and (x_2, y_2) is given by the formula $m =$ _____.

2. The slope of the line through the distinct points (x_1, y_1) and (x_2, y_2) can be interpreted as the rate of change in _____ with respect to _____.

3. If a line rises from left to right, the line has _____ slope.

4. If a line falls from left to right, the line has _____ slope.

5. The slope of a horizontal line is _____.

6. The slope of a vertical line is _____.

7. If two distinct nonvertical lines have the same slope, then the lines are _____.

8. If the product of the slopes of two lines is -1, then the lines are _____.

Practice Exercises:

In exercises 1 - 9 odd, find the slope of the line passing through each pair of points or state that the slope is undefined. Then indicate whether the line through the points rises, falls, is horizontal or is vertical.

1. (4,7) and (8,10)   3. (-2,1) and (2,2)
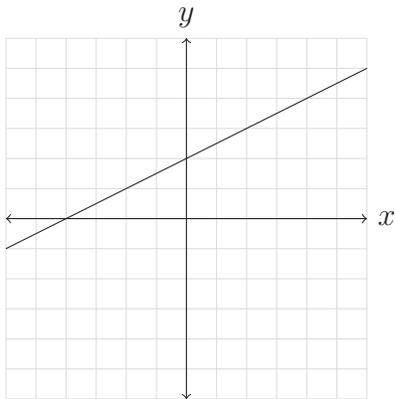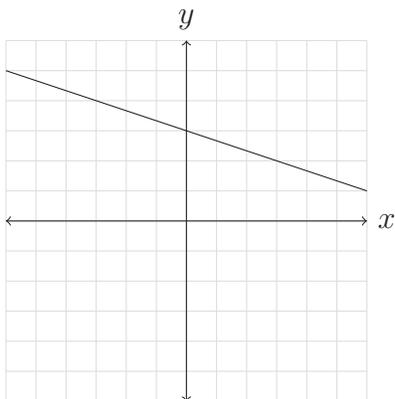
5. (4,-2) and (3,-2)

9. (5,3) and (5,-2)

7. (-2,4) and (-1,-1)

In exercises 11 - 21 odd, find the slope of each line shown in the text or state that the slope is undefined.
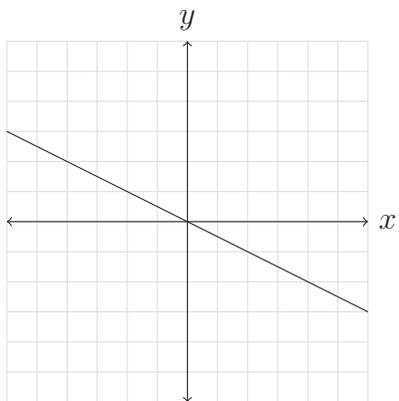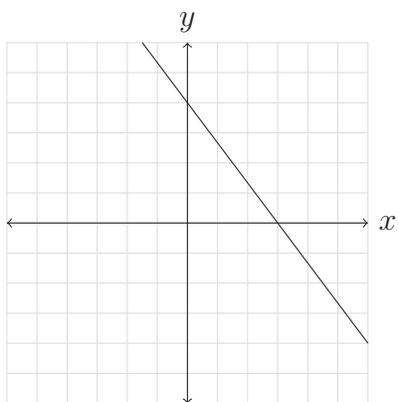
11.

13.

15.
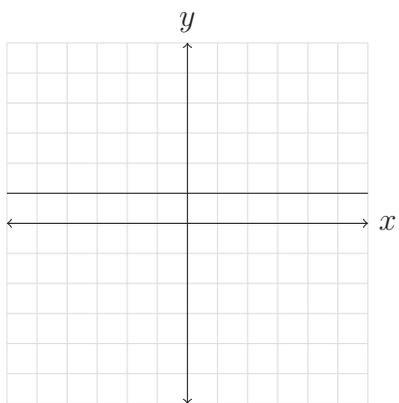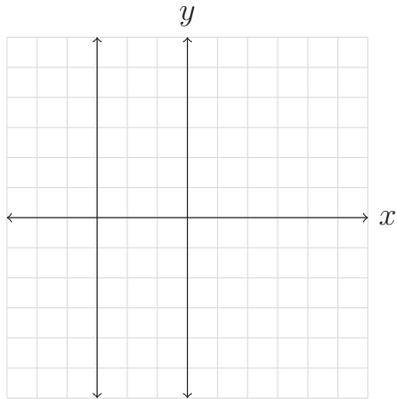
17.

19.

21.

In exercises 23 - 35 odd, determine whether the distinct lines through each pair of points are parallel, perpendicular or neither.

23. (-2,0) and (0,6); (1,8) and (0,5)

29. (-1,-6) and (2,9); (-15,-1) and (5,3)

25. (0,3) and (1,5); (-1,7) and (1,10)

31. (-2,-5) and (3,10); (-1,-9) and (4,6)

27. (1,5) and (0,3); (-2,8) and (2,6)

33. (-4,-12) and (0,-4); (0,-5) and (2,-4)

35. (-5,-1) and (0,2); (-6,9) and (3,-6)

37. On the same set of axes, draw lines passing through the origin with slopes -1, $-\frac{1}{2}$, 0, $\frac{1}{3}$ and 2.
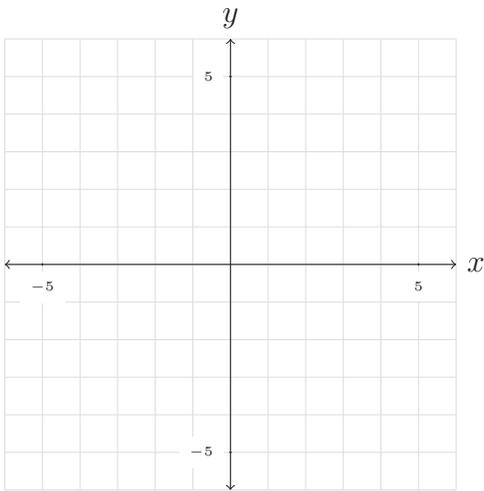
39. Show that the points whose coordinates are (-3,-3), (2,-5), (5,-1) and (0,1) are the vertices of a four-sided figure whose opposite sides are parallel. (Such a figure is called a parallelogram.) [Hint: Draw a picture on the following graph. Find the slopes between the four sets of points which make up the sides and show that there are two matching pairs.]
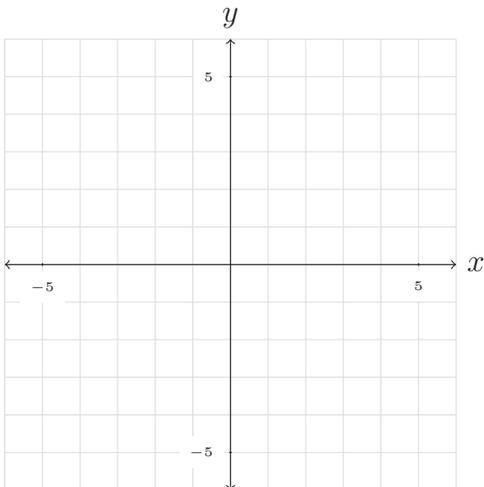
Applications:

45. Exercise is useful not only in preventing depression, but also as a treatment. The graphs in the text show the percentage of patients with depression in remission when exercise (brisk walking) was used as a treatment. (The control group that engaged in no exercise had 11% of the patients in remission.)

    a. Find the slope of the line passing through the two points shown by the voice balloons. Express the slope as a decimal.

    b. Use your answer from part (a) to complete this statement:

    For each minute of brisk walking, the percentage of patients with depression in remission increased by ___%. The rate of change is ___% per _____.

47. The pitch of a roof refers to the absolute value of its slope. Find the pitch of the roof shown in the picture in the book.

49. The grade of a road or ramp refers to its slope expressed as a percentage. Construction laws are very specific when it comes to access ramps for the disabled. Every vertical rise of 1 foot requires a horizontal run of 12 feet. What is the grade of such a ramp? Round to the nearest tenth of a percent. [There is a picture in the book you may want to refer to.]

SUPPLEMENT TO §3.3

1. State whether the rate is positive, negative, or zero for the given scenario.

   a. The rate at which a child's height changes with respect to time.

   b. The rate at which an elderly person's height changes with respect to time.

   c. The rate at which a middle aged person's height changes with respect to time.

   d. The rate at which a pond's water level changes during a drought with respect to time.

   e. The rate at which a pond's water level changes during the rainy season with respect to time.

   f. The rate at which a healthy person's heart beats while they are at rest with respect to time.

2. Interpret the slope of each of the following formulas as a rate of change in practical terms. Make sure you include the unit of the slope in your interpretation.

   a. The temperature in Mathville on November 5, 2013 is given by the formula

   $$T = -2.1t + 54$$

   where T represents the temperature in degrees Fahrenheit and t represents the time (in minutes) since $9:00$am.

   b. The number of calories a runner burns is given by the formula

   $$C = 15t$$

   where C represents the number of calories burned and t represents the time (in minutes) spent running.

   c. The average price of a new laptop computer is given by the formula

   $$A = -\frac{50}{3}t + 1200$$

   where A represents the average price, in dollars, of a new laptop computer and t represent the number of months since December 2006.

   d. The number of dollars a professional blogger is paid is given by the formula

   $$A = 25p$$

   where p represents the number of posts they create.

3. Elijah, Logan, and Savannah each go out for separate walks. The following graph, table, and formula describe the number of kilometers, D, that Elijah, Logan, and Savannah have walked in t hours respectively.

Time in Hours
Figure 1: Elijah's distance walked.
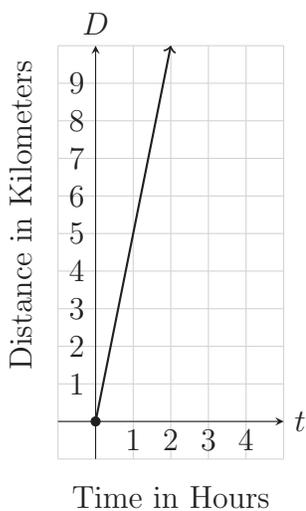
t (hours)	D (km)
0	0
2	9
4	18
6	27

Table 1: Logan's distance walked.

The distance Savannah walked is given by the formula

$$D = \frac{13}{4}t.$$

Given this information, who walks fastest and who walks slowest? How do you know?

ANSWERS TO SUPPLEMENT §3.3**:**

1. a. Positive   c. Zero   e. Positive

    b. Negative   d. Negative   f. Zero

2. a. The temperature in Mathville was decreasing at a rate of $2.1 \; \frac{°\text{F}}{\text{minute}}$.

   c. The average price of a new laptop computer is decreasing at a rate of $\frac{50}{3} \frac{\text{dollars}}{\text{month}}$.

   b. The number of calories the runner burns increases at a rate of $15 \; \frac{\text{calories}}{\text{minute}}$.

   d. The amount a professional blogger is paid increases at a rate of $25 \; \frac{\text{dollars}}{\text{post}}$.

3. Elijah is walking at a rate of 5 kilometers per hour, Logan at a rate of 4.5 kilometers per hour, and Savannah at a rate of 3.25 kilometers per hours, thus Elijah is walking the fastest and Savannah the slowest.