

Chapter 7 Linear Equations and Graphs

7.1 Slope-Intercept Form

KEY IDEAS

- The slope-intercept form of a linear equation is $y = mx + b$, where m represents the slope and b represents the y -intercept.

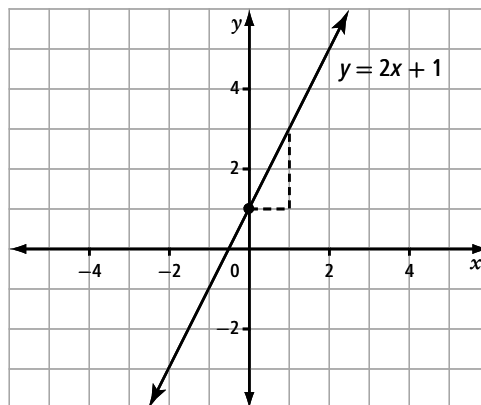
$$y = 2x + 1$$

$$\text{slope} = 2$$

$$\frac{\text{rise}}{\text{run}} = \frac{2}{1}$$

$$y\text{-intercept} = 1$$

The graph passes through $(0, 1)$.



Example

Consider the given graph.

- What is the slope of the line?
- What is the y -intercept?
- What is the equation of the line in slope-intercept form?

Solution

- Using the points $(0, 3)$ and $(1, 1)$, the slope is

$$m = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{1 - 3}{1 - 0}$$

$$m = \frac{-2}{1}$$

$$m = -2$$

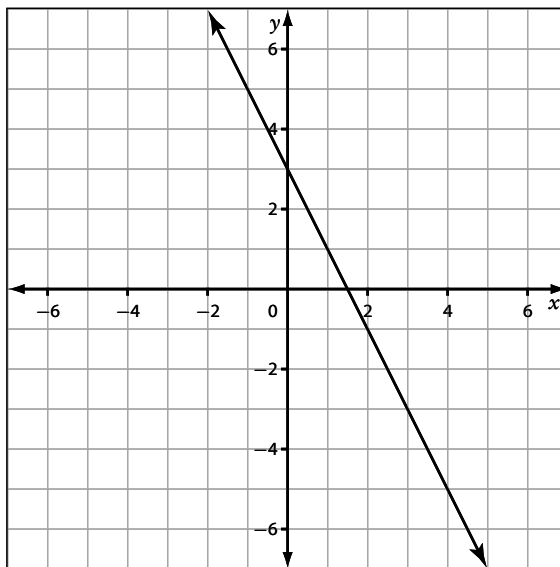
The slope is -2 .

- The line crosses the y -axis at the point $(0, 3)$. Therefore, $b = 3$.

- Substitute the values $m = -2$ and $b = 3$ into the slope-intercept form of an equation.

$$y = mx + b$$

$$y = -2x + 3$$



A Practise

1. What are the slope and y -intercept of each line?

a) $y = \frac{1}{2}x - 2$

b) $y = -4x + 3$

c) $y = x$

d) $y = 0.75x + 3.5$

- ★2. Convert each of the following into slope-intercept form. Then, state the slope and y -intercept.

a) $x + y = 7$

b) $y - 4x = 12$

c) $5x + 2y = 10$

d) $x - 3y - 12 = 0$

3. Given the slope and y -intercept, write an equation of the line in slope-intercept form.

a) $m = 4; b = -1$

b) $m = -\frac{1}{2}; b = 7$

c) $m = \frac{2}{3}; b = -2$

d) $m = 0.5; b = 0$

e) $m = -5; b = 1$

f) $m = 1; b = \frac{4}{5}$

4. Draw the graph of each line using the slope and y -intercept. Use graphing technology to check your graphs.

a) $y = 2x + 5$

b) $y = 3x - 1$

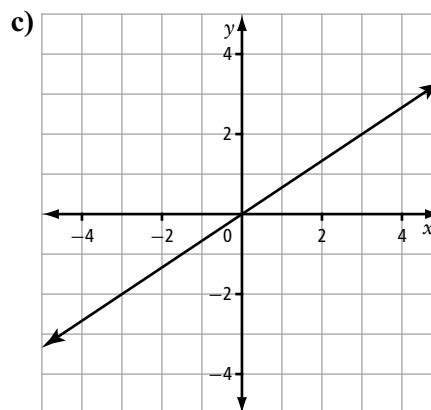
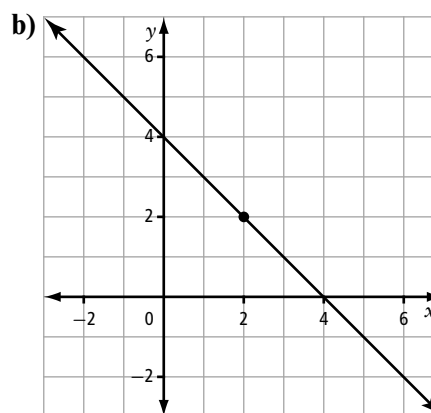
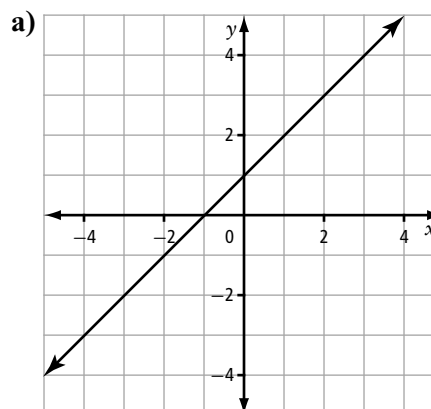
c) $y = x + 6$

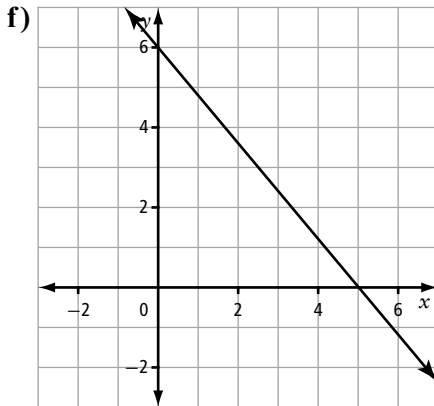
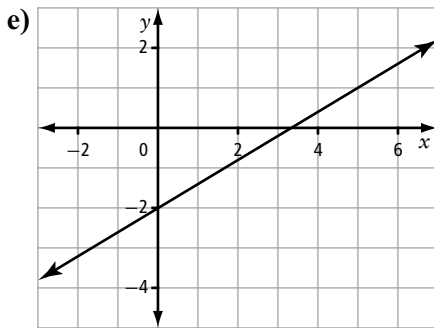
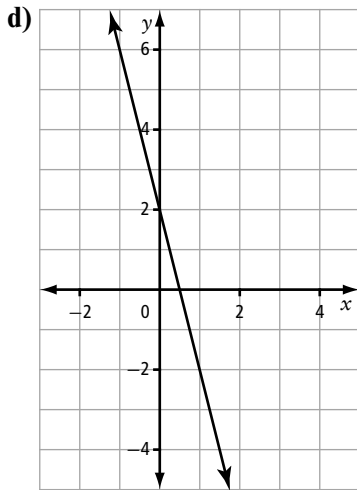
d) $y = -x$

e) $x - 3y - 9 = 0$

f) $y + 4 = 5x$

5. What are the slope and y -intercept of each line? Write the equation of each line in slope-intercept form.





- ★6. An equation of a line is $y = \frac{1}{2}x + b$.
What is the value of b if the line passes through the given point?

a) (12, 8) b) $(-3, \frac{1}{2})$

7. An equation of a line is $y = mx - 8$.
What is the value of m if the line passes through the given point?

a) (4, 0) b) (-3, 4)

B Apply

8. Mr. Wong's class is holding a raffle to raise money for earthquake relief efforts. The class buys a pair of Edmonton Oilers hockey tickets for \$250 as the prize. The raffle tickets are going to be sold for \$2 each.
- Write a linear equation to represent the money raised based on the ticket sales, x , and the cost of the prize.
 - What is the slope of the line? What does it represent?
 - What is the y -intercept? What does it represent?
 - How many tickets does the class need to sell if they want to raise \$300.00?
9. The Rabbit Hill Snowboard and Ski Resort is sponsoring a freestyle snowboard competition. Each competitor pays an entry fee of \$75. The winner gets \$600.
- Write a linear equation, in slope-intercept form, to show the relationship between the number of contestants, x , and the money generated from the competition, y .
 - How much money will organizers make if 5 contestants enter? 15? 25?
 - How many competitors need to enter for the organizers to break even?
10. Ernesto needs to rent a paint sprayer. His friend Daniela rented one and paid \$15/h plus a fixed charge. Daniela could not remember the fixed charge, but remembered that she rented the sprayer for 4 hours and paid \$85.
- What is the fixed charge?
 - Write an equation in slope-intercept form to represent the cost, y , for x hours to rent a paint sprayer.
 - What is the y -intercept? What does it represent?
 - Describe the graph.

- ★11. The following table relates the number of litres left in a car's fuel tank to the distance travelled.

Distance (km)	Fuel (L)
0	60
50	56
100	52
150	48
200	44

- Draw a graph of the relation.
 - What is the slope of the line? What is the y -intercept?
 - Write the equation in slope-intercept form.
 - What does the y -intercept represent?
 - After how many kilometres will the tank be empty?
12. The cost of printing programs for the school play, y , is a fixed charge of \$200 for the artwork, plus \$0.25 for each program.
- Build a table of values to represent the cost of printing 50, 100, 150, 200, and 250 programs.
 - Draw a graph of the relation.
 - What is the slope? What does it represent?
 - What is the y -intercept? What does it represent?
 - Write the equation in slope-intercept form.
 - How many programs can be printed if the school wants to spend \$350 on programs?

C Extend

- ★13. The following table shows the linear relationship between temperatures in degrees Celsius and temperatures in degrees Fahrenheit.

°C	°F
-50	-58
-10	14
5	41
20	68

- Sketch the graph of the line through the points.
- What is the slope?
- What is the y -intercept? What does it represent?
- Write the equation in slope-intercept form, where x represents degrees Celsius and y represents degrees Fahrenheit.
- Write the inverse of your equation in part d), where x is replaced with y , and y is replaced with x . Write this equation in slope-intercept form.
- Calculate the conversions using your graph or equation.
 $-40\text{ }^{\circ}\text{C} = \text{ }^{\circ}\text{F}$
 $100\text{ }^{\circ}\text{F} = \text{ }^{\circ}\text{C}$
 $0\text{ }^{\circ}\text{C} = \text{ }^{\circ}\text{F}$

14. Maureen is hosting a party and needs to choose a hall. Clarksdale Hall charges \$200 for hall rental and \$12/person for food and drinks. Lane Hall charges \$320 for hall rental and \$10.50/person for food and drinks. Use linear equations to determine the number of people that would make the costs for both halls the same.

D Create Connections

15. Given the linear equation $4x - y + 12 = 0$,
- graph the line by building a table of values
 - graph the line by using the slope and y -intercept of the line
 - Which method do you prefer? Explain.