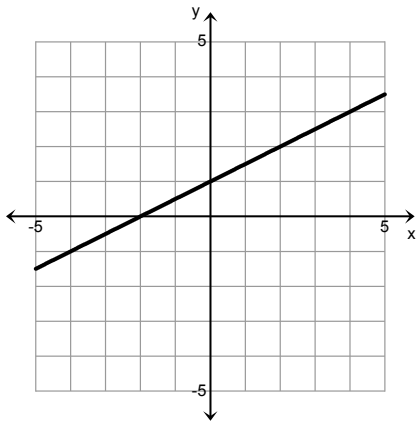
Unit 4 Notes

Writing an Equation from a Graph in Slope-Intercept Form	**Steps** 1. **Find the slope, m, from the graph** 2. **Find the y-intercept, b, from the graph** 3. **Write the equation in slope-intercept form using the values you found for m and b** $y = \boxed{m}\,x + \boxed{b}$

Example One

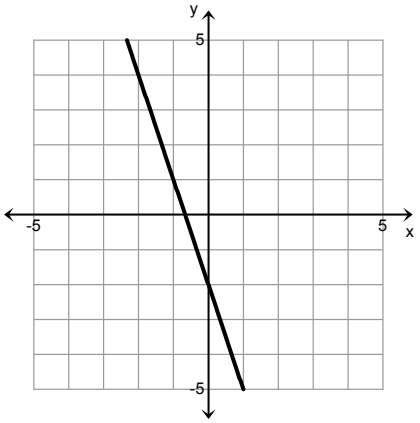


What is the slope of the line?

What is the y-intercept of the line?

Write the equation in slope-intercept form:

Example Two

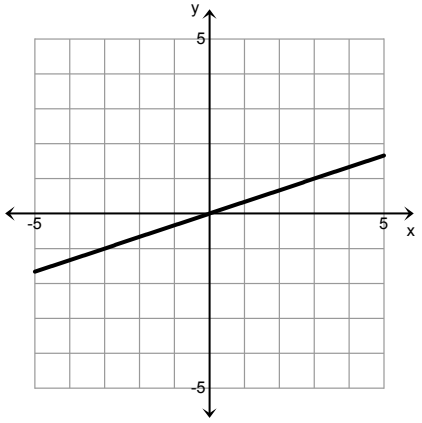


What is the slope of the line?

What is the y-intercept of the line?

Write the equation in slope-intercept form:

Example Three

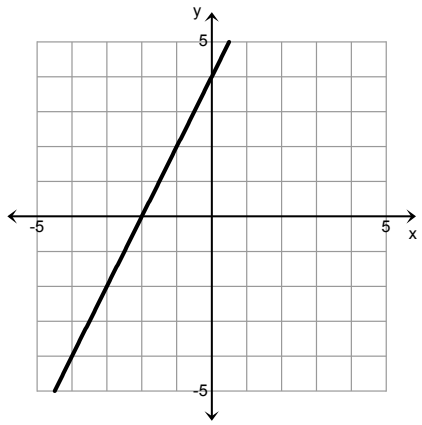


What is the slope of the line?

What is the y-intercept of the line?

Write the equation in slope-intercept form:

Example Four



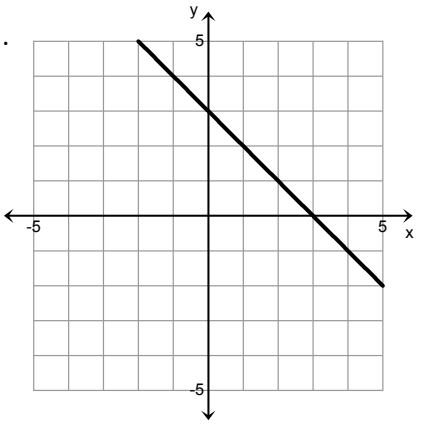
What is the slope of the line?

What is the y-intercept of the line?

Write the equation in slope-intercept form:

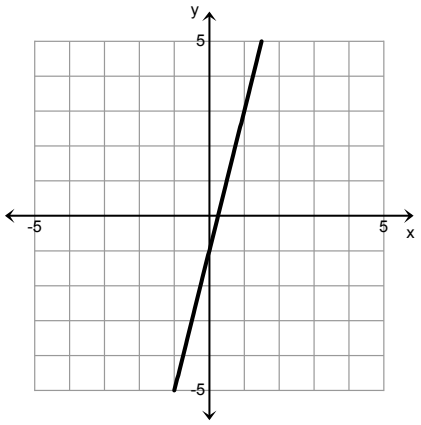
Try These

1.



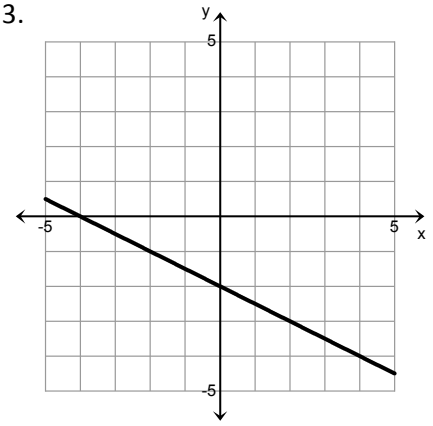
Equation:

2.



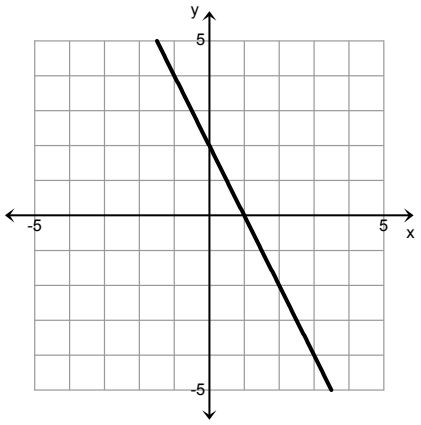
Equation:

3.



Equation:

4.



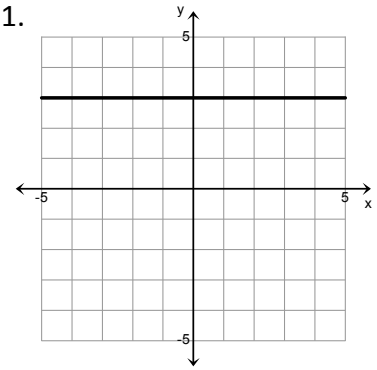
Equation:

Writing the Equation of Horizontal and Vertical Lines

Equation of a Horizontal Line	Equation of a Vertical Line
$y = b$	$x = a$
which crosses the y-axis at b	**which crosses the x-axis at a**

Examples

1.



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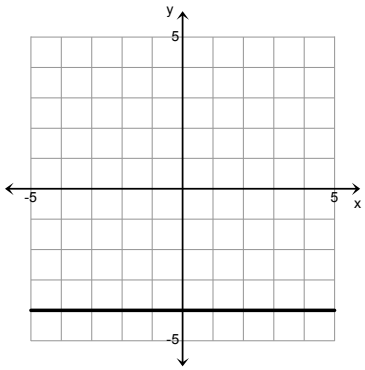
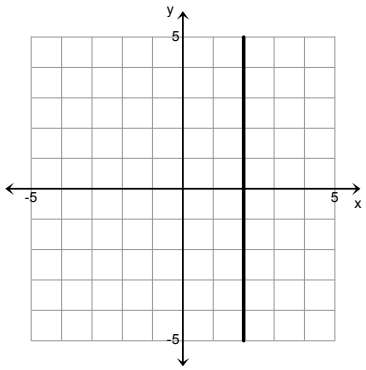
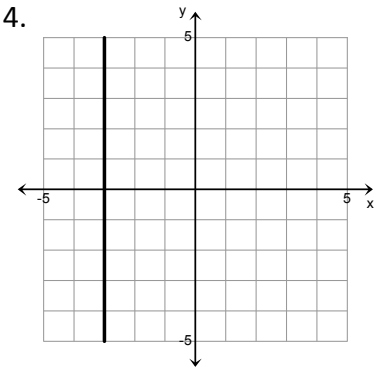


3.

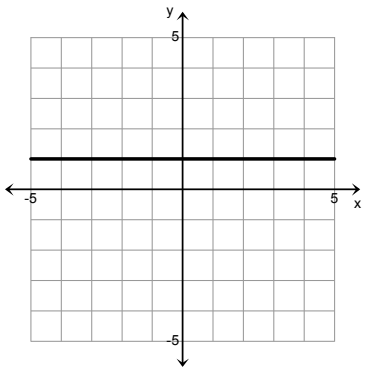


Try These

4.



5.



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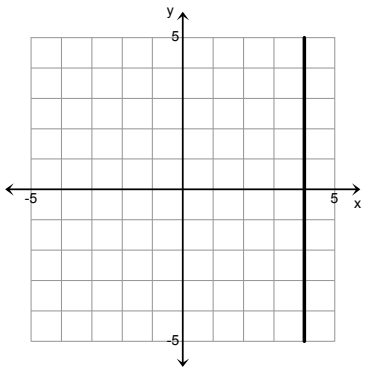


Writing an Equation given the Slope and a Point

Steps for Writing an Equation given Slope and a Point	**Steps** 1. **Using $y = mx + b$, substitute in the slope and the x- and y-values from the point** 2. **Solve the equation to find b, the y-intercept** 3. **Write the equation using the slope and the y-intercept**

Example One

Write the equation of the line in slope-intercept form that has a slope of 2 and goes through the point (2, 1)

Example Two

Write the equation of the line in slope-intercept form that has a slope of $-\frac{2}{3}$ and goes through the point $(6, -2)$

Example Three

Write the equation of the line in slope-intercept form that has a slope of -1 and goes through the point $(-1, -4)$

Try These

1. Write the equation of the line in slope-intercept form that contains the point (6, 0) and has a slope of $\frac{1}{2}$.

2. Write the equation of the line in slope-intercept form line that has a slope of $-\frac{1}{4}$ and contains the point (–8, –1).

3. Write the equation of the line in slope-intercept form that has a slope of 3 and goes through the point (2, 8).

4. Write the equation of the line in slope-intercept form that has a slope of –2 and goes through the point (1, –3).

5. Write the equation of the line in slope-intercept form that goes through the point (15, 2) and has a slope of $\frac{3}{5}$.

Writing an Equation given Two Points on the Line

Steps for Writing an Equation given Two Points on the Line	**Steps** 1. **Using the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$, find the slope.** 2. **Using $y = mx + b$, substitute in the slope and the x- and y-values from one of the two points (you pick which one)** 3. **Solve the equation to find b, the y-intercept** 4. **Write the equation using the slope and the y-intercept**

Example One

Write the equation, in slope-intercept form, of the line that contains the points (3, 3) and (5, 7).

Example Two

Write the equation of the line that contains the points (–4, 7) and (10, 0).

Example Three

Write the equation of the line that contains the points (1, 3) and (4, –9).

Try These

1. Write the equation of the line in slope-intercept form that contains the points (4, 0) and (6, 8).

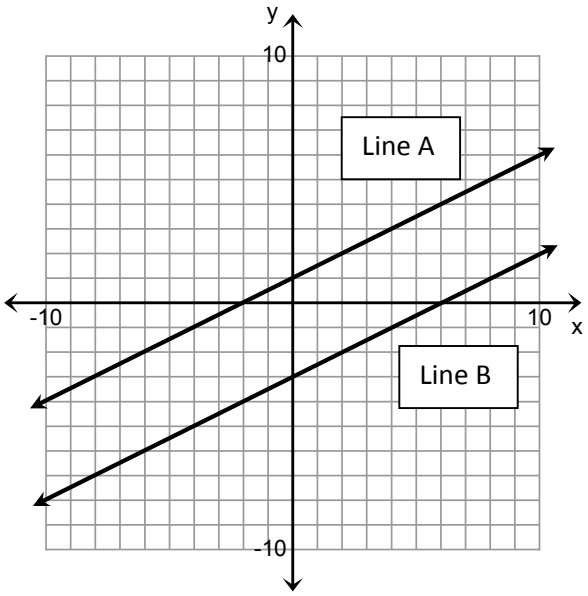
2. Write the equation of the line in slope-intercept form that contains the points (–6, –2) and (–3, –3).

3. Write the equation of the line in slope-intercept form that contains the points (3, 4) and (–1, –2).

4. Write the equation of the line in slope-intercept form that contains the points (6,6) and (–2, –2).

5. Write the equation of the line in slope-intercept form that contains the points (1, –9) and (–3, 3).

Parallel Lines



The two lines are parallel.

Write the equation of Line A:

Write the equation of Line B:

What do you notice about the equations?

Parallel Lines	**Lines that have the SAME SLOPE but different y-intercepts are parallel lines.**

Examples

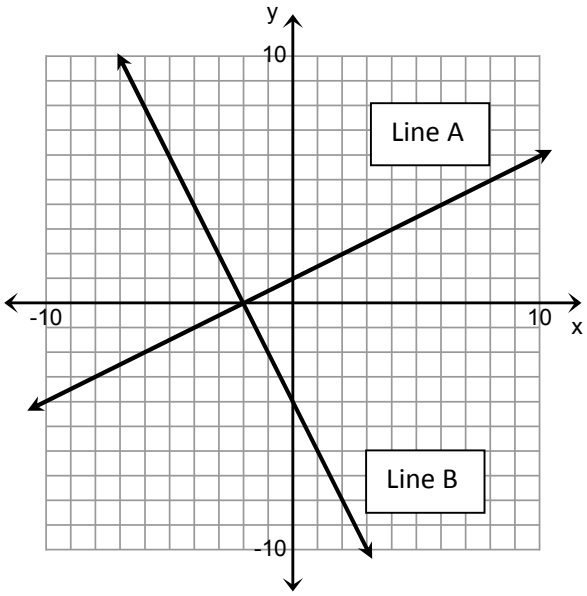
1. What is the slope of a line parallel to $y = 3x - 5$?

2. What is the slope of a line parallel to $y = -7x + 2$?

3. What is the slope of a line parallel to $4x + 2y = 8$?

4. What is the slope of a line parallel to $8x - y = 3$?

Perpendicular Lines



The two lines are perpendicular.

Write the equation of Line A:

Write the equation of Line B:

What do you notice about the equations?

Perpendicular Lines	**Two lines with slopes that are OPPOSITE RECIPROCALS are perpendicular lines.**

Examples

The **opposite** of a is $-a$. The **reciprocal** of a is $\frac{1}{a}$.

1. Find the opposite reciprocal of the following numbers:
   a. 3
   b. $-\frac{2}{3}$
   c. -1
   d. $\frac{1}{2}$
   e. 6
   f. $\frac{7}{2}$

2. What is the slope of a line perpendicular to $y = 4x - 1$?

3. What is the slope of a line perpendicular to $y = -\frac{1}{2}x - 2$?

4. What is the slope of a line perpendicular to $3x - y = 5$?

5. What is the slope of a line perpendicular to $x - 5y = 3$?

Writing the Equation of Parallel and Perpendicular Lines

Steps for Writing the Equation of Parallel and Perpendicular Lines	1. **Determine the slope of the equation based on the equation given** • **Parallel = same slope** • **Perpendicular = opposite reciprocal** 2. **Using $y = mx + b$, substitute in the slope and the x- and y-values from the point** 3. **Solve the equation to find b, the y-intercept** 4. **Write the equation using the slope and the y-intercept**

Example One

Write the equation of the line, in slope-intercept form, that passes through the point (3, 5) and is **PARALLEL** to $y = -2x + 9$.

Write the equation of the line, in slope-intercept form, that passes through the point (3, 5) and is **PERPENDICULAR** to $y = -2x + 9$.

Example Two

Write the equation of the line, in slope-intercept form, that passes through the point (– 4, 1) and is **PERPENDICULAR** to $x - 3y = 6$.

Write the equation of the line, in slope-intercept form, that passes through the point (– 4, 1) and is **PARALLEL** to $x - 3y = 6$.

Try These

Write the equation of the line, in slope-intercept form, given the following information.

1. parallel to $5x - 2y = 10$ and passes through the point (6, –5)

2. perpendicular to $y = 3x - 4$ and passes through the point (3, 7)

3. passes through the point (– 1, 4) and is parallel to $y = 2x + 5$

4. passes through the point (6, –4) and is perpendicular to $3x + y = 5$

Modeling with Linear Equations

Example One

Many electricians use a fixed-cost equation to determine how much to charge for a house call. For example, an electrician might charge $\$45$ for coming to your house and $\$25$ for each hour of service.

a. What is the fixed-cost equation?

b. How much would this electrician charge you for coming to your house and working for 3 hours?

Example Two

Joe purchased a GoPhone. He paid $\$16$ for 2 hours of talk time in January and $\$24$ for 5 hours of talk time in February.

a. Write an equation where x represents the number of hours and y represents the total monthly bill.

b. Joe used the phone for 8 hours in March. How much does he have to pay?

Example Three

If the air temperature is 76 °F at 8 A.M. and 92 °F at 4 P.M., write an equation where x represents the number of hours and T represents the temperature.

Try These

1. Athletic Fitness offers gym memberships at a cost of $\$16$ per month and a one-time enrollment fee of $\$30$.
    a. Write a linear equation to find the total cost, C, to enroll at the gym for n number of months.

    b. How much does it cost for two years?

2. The cost for 7 dance lessons is $\$82$. The cost for 11 dance lessons is $\$122$.
    a. Write a linear equation to find the total cost, C, for x lessons.

    b. How much does it cost for 15 dance lessons?

3. Marlin rented a truck to move furniture. He drove 26 miles on Monday and it cost him $\$53$ to rent the truck for the day. He drove 38 miles on Tuesday and it cost him $\$59$ for the day.
    a. Write a linear equation to find the rental cost, C, for driving the truck m miles.

    b. If he drives 79 miles on Wednesday, how much will it cost him to rent the truck?