Name _____ Date _____

4.2 Notetaking with Vocabulary

I can write equations in point-slope form.
I can use linear equations to solve real-life problems (mathematical modeling).

All linear forms
$y = mx + b$
$Ax + By = C$
$y - y_1 = m(x - x_1)$

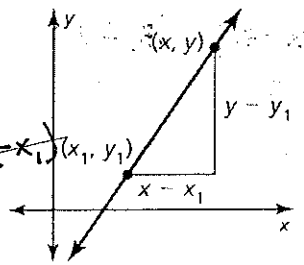
Point-Slope Form

Words A linear equation written in the form $y - y_1 = m(x - x_1)$

is in **point-slope form**.

The line passes through the point (x_1, y_1)

and the slope of the line is m.



Derivation of equation: $\therefore m = \frac{y_2 - y_1}{x_2 - x_1} \cdot (x_2 - x_1)$

Algebra:

$(x_2 - x_1)m = y_2 - y_1$

$m(x_2 - x_1) = y_2 - y_1$

$y_2 - y_1 = m(x_2 - x_1)$

$y - y_1 = m(x - x_1)$

In Exercises 1–6, write an equation in point-slope form of the line that passes through the given point and has the given slope. $y - y_1 = m(x - x_1)$

1. $(-2, 1); m = -3$ (x_1, y_1)

$y - 1 = -3(x - -2)$

$y - 1 = -3(x + 2)$

2. $(3, 5); m = 2$

3. $(-1, -2); m = -1$

$y - -2 = -1(x - -1)$

$y + 2 = -1(x + 1)$

4. $(5, 0); m = \frac{4}{3}$

$y - 0 = \frac{4}{3}(x - 5)$

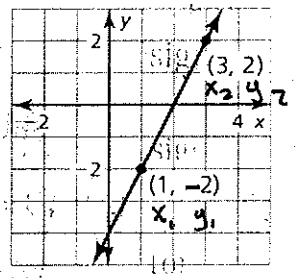
5. $(0, 4); m = 7$

$y - 4 = 7(x - 0)$

6. $(1, 2); m = -\frac{1}{2}$

In Exercises 7–9, write an equation in point-slope form of the line shown.

7.



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

$m = \frac{2 + (-2)}{3 - 1} = \frac{4}{2} = 2$

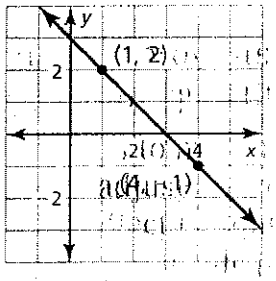
use $(1, -2)$

$y + 2 = 2(x - 1)$

use $(3, 2)$

$y - 2 = 2(x - 3)$

8.



$y + 2 = 2(x - 1)$

$y + 2 = 2x - 2$

$-2 \quad -2$

$y = 2x - 4$

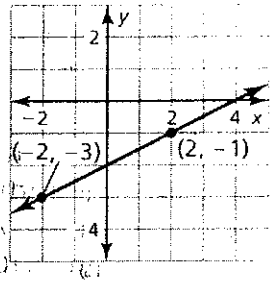
$y - 2 = 2(x - 3)$

$y - 2 = 2x - 6$

$+2 \quad +2$

$y = 2x - 4$

9.



In Exercises 10–12, write a linear function f with the given values. $y = mx + b$

10. $f(-3) = -1, f(-2) = 4$ 11. $f(-2) = 1, f(1) = 7$ 12. $f(-1) = 2, f(3) = 3$

$(-3, -1) \quad (-2, 4)$

$x_1 \; y_1 \quad x_2 \; y_2$

$m = \frac{4 + (-1)}{-2 + (-3)} = \frac{5}{1} = 5$

$y - 4 = 5(x + 2)$

$y - 4 = 5x + 10$

$+4 \quad +4$

$y = 5x + 14$

How do we tell if we can model data using a linear model?

If it has a constant rate of change.

In Exercises 13 and 14, tell whether the data in the table can be modeled by a linear equation. Explain. If possible, write a linear equation that represents y as a function of x (use point-slope form to get there).

$y = mx + b$

13.

x	−3	−1	0	1	3
y	−110	−60	−35	−10	40

$m = \frac{40-(-10)}{3-1} = \frac{50}{2} = 25$

$m = \frac{-35+(+60)}{0+(+1)} = \frac{25}{1}$

$m = \frac{50}{2} = 25$

Data is linear b/c rate of change is constant, $m = 25$

14.

x	−3	−1	0	1	3
y	−98	18	8	62	142

$m = \frac{-10+(+35)}{1-0}$

$m = \frac{25}{1}$

$m = \frac{-60+(+110)}{-1+(+3)}$

$m = \frac{50}{2} = 25$

$y - 40 = 25(x - 3)$

$y - 40 = 25x - 75$

$+40 \quad +40$

$y = 25x - 35$

15. Craig is driving at a constant speed of 60 miles per hour. After driving 3 hours, his odometer reads 265 miles. Write a linear function D that represents the miles driven after h hours. What does the odometer read after 7 hours of continuous driving?

h = hours (ind. x)

D = miles on odometer (y)

rate $\frac{60 \text{ miles}}{\text{hr}} = m$

$h \quad D$

$(3, 265)$

$y - y_1 = m(x - x_1)$

$D - D_1 = m(h - h_1)$

$D - 265 = 60(h - 3)$

$D - 265 = 60h - 180$

$+265 \qquad +265$

$D = 60h + 85$

$h = 7$

$D = 60(7) + 85$

$D = 420 + 85$

$D = 505$

The odometer reads 505 miles after driving 7 hours.