Unit 6

Slope and Rate of Change

ALGEBRA 1

Slope

- Change in y over change in x
- Rate of Change
- $\frac{rise(up\ or\ down)}{run(right)}$

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

Where $(x_1, y_1)\ and\ (x_2, y_2)$

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

FIND THE SLOPE

$x_1, y_1 \quad x_2, y_2$

(4, −7) & (−5, 5)

$m = \frac{5 - (-7)}{-5 - (4)}$

$= \frac{5+7}{-5-4} = \frac{12}{-9}$

$= \frac{-12}{9} = \boxed{\frac{-4}{3}}$

Use ANS

Use 2nd ANS when ⌴

~~(−5.3, 6.2) & (−9.3, 10.1)~~

(−5, −6) & (−9, 10)

$x_1, y_1 \quad x_2, y_2$

$m = \frac{10 - (-6)}{-9 - (-5)}$

$m = \frac{10+6}{-9+5} = \frac{16}{-4}$

$m = \frac{-16}{4} = \boxed{-4}$

~~$\left(\frac{7}{8}, \frac{6}{7}\right)$ & $\left(\frac{2}{3}, 4\right)$~~

(7, 6) & (2, 4)

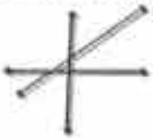
$x_1, y_1 \quad x_2, y_2$

$m = \frac{4 - (6)}{2 - (7)} = \frac{-2}{5}$

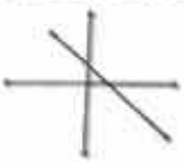
$= \boxed{\frac{2}{5}}$

FIND THE SLOPE

Positive Slope:

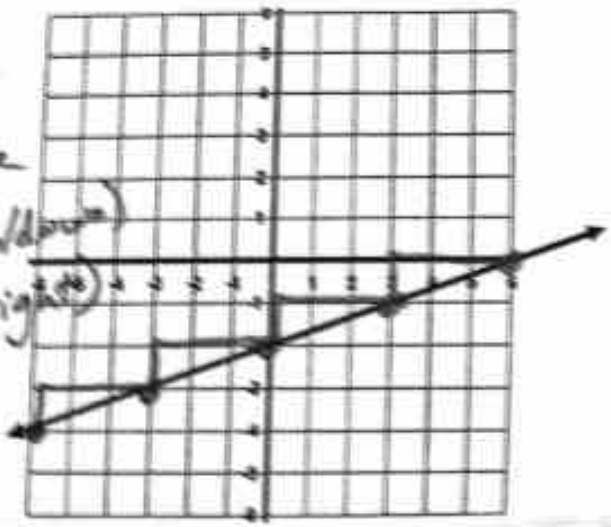


Negative Slope:



$m =$ positive

$m = \frac{\text{rise (up)}}{\text{run (right)}}$

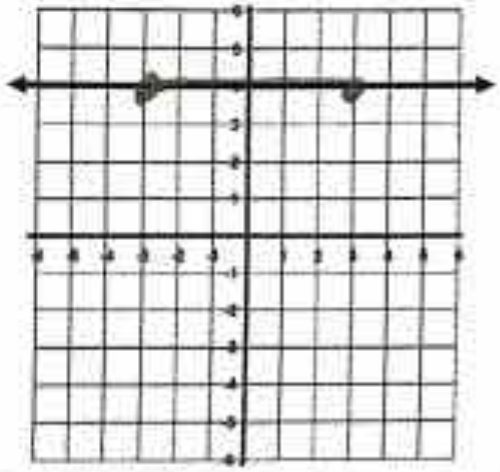


$m = \boxed{\frac{1}{3}}$

When y = #, the slope is 0. The graph is a horizontal line (Left and Right)

$m = 0$

b/c $m = \frac{0}{6} = 0$

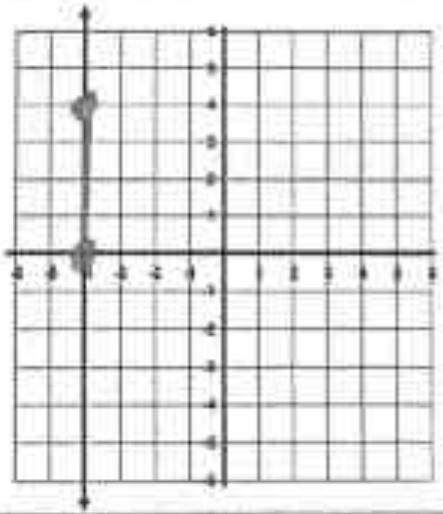


When x = #, the slope is UNDEFINED and the line is vertical (up and down)

m = undefined

b/c $m = \frac{4}{0}$

= undefined



9/3/2019

Kilo = 1000 meters
minute = 60 seconds

Unit 6

Slope and Rate of Change

ALGEBRA 1

rate of change = slope

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

In 1983 a locally-owned car company sold 2,784 cars.
In 2003, the car sales rose to 4,029.
What was the average rate of change for the total number of cars sold?

A. 1,245 cars per year
B. 16.08 cars per year
C. 3,407 cars per year
D. 62 cars per year

$\frac{\text{cars sold}}{\text{years}}$

$\frac{4029-2784}{2003-1983} = \frac{1245}{20} = 62.25 \approx 62$

Tom ran a 5-kilometer race in 57 minutes. To the nearest hundredth, what was his speed in meters per second?

A. [illegible]
B. [illegible]
C. 1.46
D. [illegible]

$\frac{\text{kilometer}}{\text{min.}} \rightarrow \frac{\text{meter}}{\text{second}}$

big → small (multiply)

$\frac{5 \times 1000}{57 \times 60} = \frac{5000}{3420} = 1.46$

"big → small multiply all"
"small → big divide a pig"
60 second = 1 minute

[illegible]

x	y
7	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

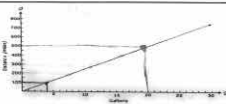
$\frac{y}{x} = \frac{3.00}{7} = \$0.428... = \$0.43$

In P.E. class, the students recorded their number of heartbeats after exercising. [illegible]

What is the rate of change of the data in heartbeats per minute?

$\frac{y}{x} = \frac{\text{heartbeats}}{\text{second}} = \frac{51}{30 \div 60} = \frac{51}{0.5} = 102$

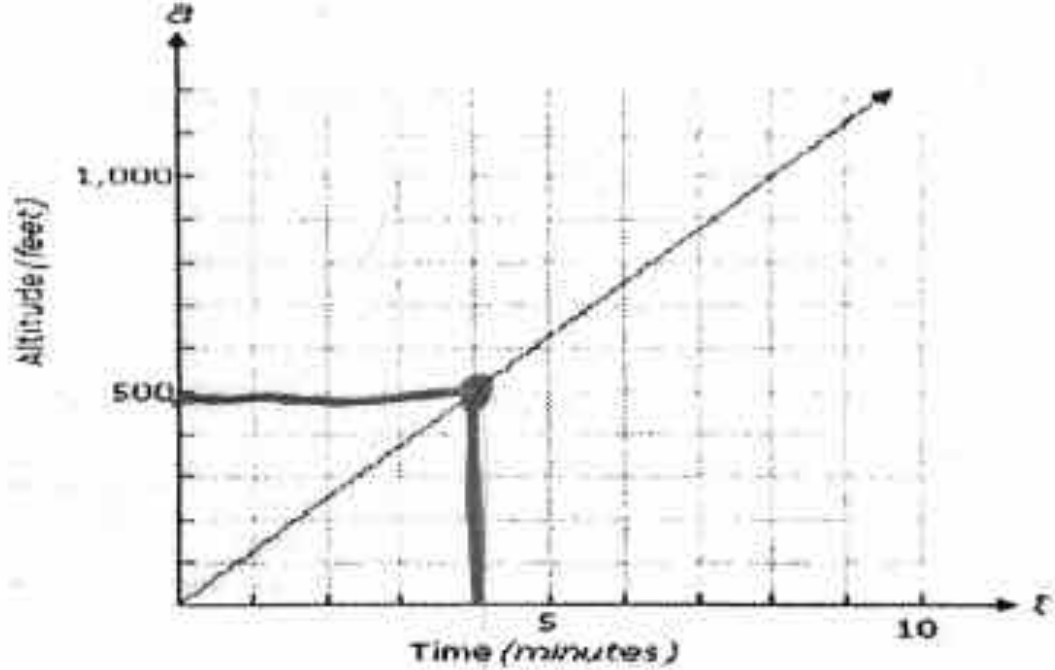
seconds → minutes
small → big divide



The graph shows the distance a car can travel, d, on g gallons of gasoline. How many miles per gallon does the car get?

A. 25 miles per gallon
B. 35 miles per gallon
C. 30 miles per gallon
D. 20 miles per gallon

$\frac{y}{x} = \frac{\text{miles}}{\text{gallon}} = \frac{100}{4} = 25$ or $\frac{500}{20} = 25$



The graph shows the altitude, a, of a plane, in feet, after t minutes. What is the rate of ascent of the airplane?

A. 120 feet per minute

B. 125 feet per minute

C. 175 feet per minute

D. 150 feet per minute

$$\frac{\text{feet}}{\text{minutes}} = \frac{500}{4} = 125$$

Unit 6

Graph Using Intercepts, Slope-Intercept, and Point-Slope Form

ALGEBRA 1

Always make m a fraction

m → slope
b → y-intercept

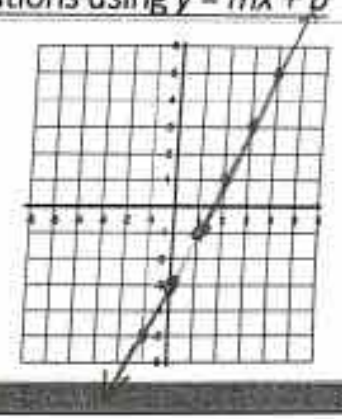
Graph the Equations using $y = mx + b$

$y = 2x - 3$

$m = 2 = \frac{2\uparrow}{1\rightarrow}$

$b = -3$

b → begin
m → map



Point-Slope Form

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

m and (x_1, y_1) *are given.*

Slope-Intercept Form

$$y = mx + b$$

m is the slope and *b* is the *y-intercept*
y-intercept: where the line crosses y-axis.

Graph the Equations using $y = mx + b$

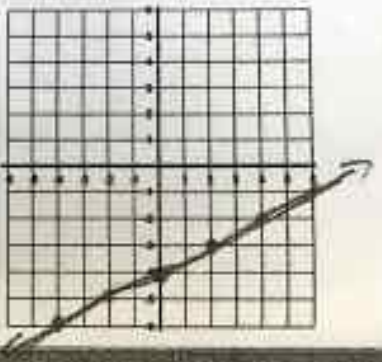
$y + 3 = \frac{1}{2}(x - 2)$

$y + 3 = \frac{1}{2}x - 1$

$-3 \quad -3$

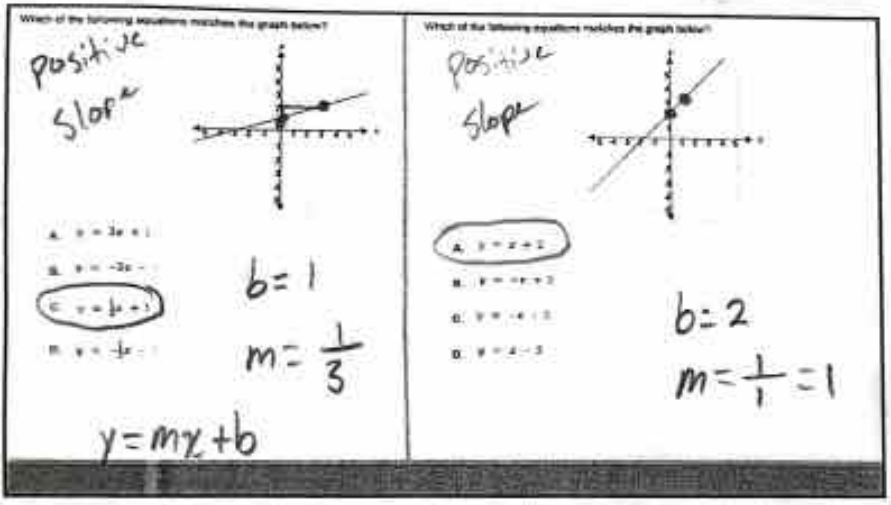
$y = \frac{1}{2}x - 4$

$m = \frac{1\uparrow}{2\rightarrow}$ $b = -4$



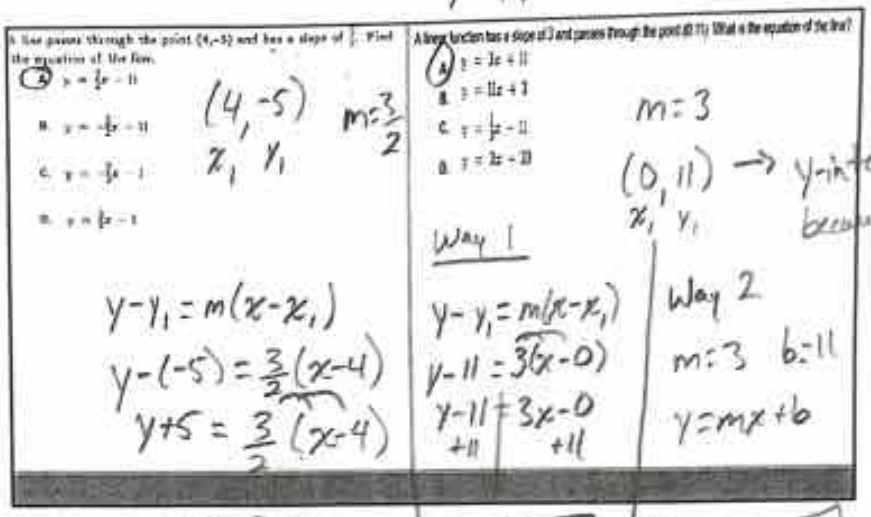
Given a point + slope, use point-slope form

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



$y = \frac{1}{3}x + 1$

$y = mx + b$
$y = 1x + 2$
$y = x + 2$

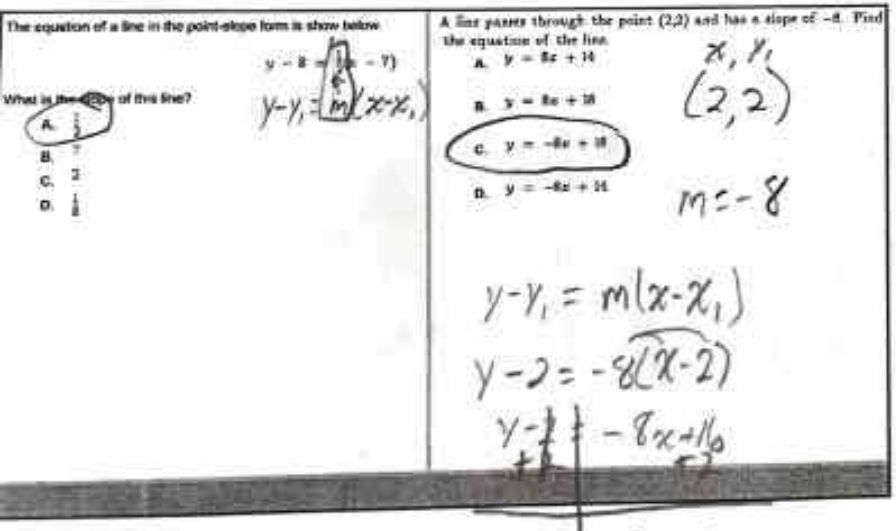


$y - y_1 = m(x - x_1)$
$y - (-5) = \frac{3}{2}(x - 4)$
$y + 5 = \frac{3}{2}(x - 4)$

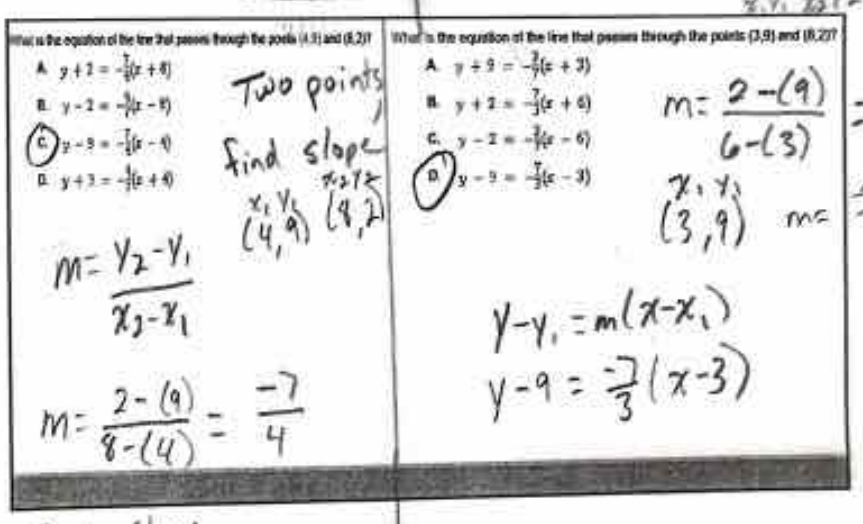
$y + 5 = \frac{3}{2}x - 6$
$-5 \quad -5$
$y = \frac{3}{2}x - 11$

Way 1:
$y - y_1 = m(x - x_1)$
$y - 11 = 3(x - 0)$
$y - 11 = 3x - 0$
$+11 \quad +11$
$y = 3x + 11$

Way 2
m = 3 b = 11
$y = mx + b$
$y = 3x + 11$



$y - y_1 = m(x - x_1)$
$y - 2 = -8(x - 2)$
$y - 2 = -8x + 16$
$+2 \quad +2$
$y = -8x + 18$



Point-slope
(4,9) $m = \frac{-7}{4}$
$y - 9 = \frac{-7}{4}(x - 4)$

Point - Slope

What is the equation of the line that has a slope of 4 and passes through the point (3,3)?

A. $y - 3 = 4(x - 3)$

B. $y - 3 = 4(x + 3)$

C. $y + 3 = -4(x + 3)$

D. $y + 3 = -4(x - 3)$

m x_1 y_1

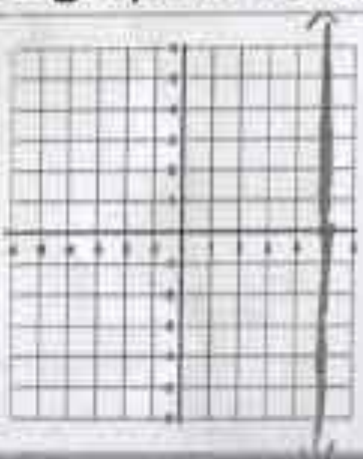
$y - y_1 = m(x - x_1)$

$y - 3 = 4(x - 3)$

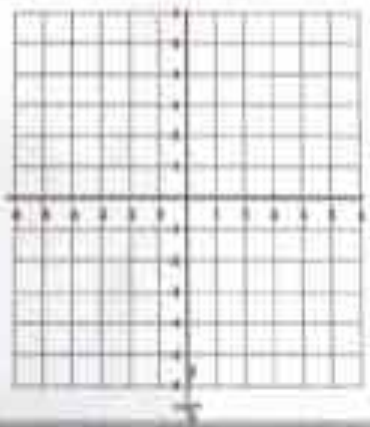
y = # the graph is horizontal

x = # the graph is vertical

$x = 5$



$y = -8$



Unit 6

Standard Form

ALGEBRA 1

Find the x and y intercept of a line.

$$-x + \frac{3}{7}y = 8$$

x-int	y-int
$\frac{-x}{-1} = \frac{8}{-1}$	$\frac{3}{7}y = 8 \cdot \frac{7}{3}$
$x = -8$	$y = \frac{56}{3}$
$(-8, 0)$	$(0, \frac{56}{3})$

1. Set y = 0 to solve for x-intercept
2. Set x = 0 to solve for y-intercept.

(x, y)

Find the x and y intercept of a line.

$$-8x + 7y = 56$$

x-int: No y

y-int: No x

x-int	y-int
$\frac{-8x}{-8} = \frac{56}{-8}$	$\frac{7y}{7} = \frac{56}{7}$
$x = -7$	$y = 8$
$(-7, 0)$	$(0, 8)$

$(x, 0)$ $(0, y)$

1. Set y = 0 to solve for x-intercept
2. Set x = 0 to solve for y-intercept.

Identify the y-intercept of the line below. $8x + 8y = 120$ $(0, y)$

A. (0, 24)

B. (15, 0)

C. (0, 15)

D. (24, 0)

$\frac{8y}{8} = \frac{120}{8}$

$y = 15$

$(0, 15)$

What is the y-intercept of the equation above? $3x - 5y = 10$ $(0, y)$

A. (0, 2)

B. $(0, 3\frac{1}{3})$

C. (0, -2)

D. $(1\frac{2}{3}, 0)$

$\frac{-5y}{-5} = \frac{10}{-5}$

$y = -2$

$(0, -2)$

9/3/2019

No fractions or decimals

A is +

$m = \frac{y_2 - y_1}{x_2 - x_1}$ ..... $y - y_1 = m(x - x_1)$

$y = mx + b$

$Ax + By = C$

x_1, y_1 x_2, y_2

Standard Form: Ax + By = C

$y = \frac{1}{7}x + 4$ ·7 ·7 ·7

$7y = 1x + 28$

$-1x + 7y = 28$

$1x - 7y = -28$

~~$y = 0.5x + 0.6$~~

$y = -\frac{2}{3}x + 5$ ·3 ·3 ·3

$3y = -2x + 15$

$2x + 3y = 15$

A line passes through (9,3) and (13,-21). Write the equation of the line in standard form.

A. $6x - y = 51$

B. $6x - y = 9$

C. $6x + y = 57$

D. $6x + y = 51$

$Ax + By = C$

$m = \frac{-21 - (3)}{13 - (9)} = \frac{-24}{4} = -6$

$y - 3 = -6(x - 9)$

$y - 3 = -6x + 54$

$+3 \quad +3$

$y = -6x + 57$

$6x + y = 57$

x_1, y_1

A line with a slope of $\frac{1}{2}$ passes through (-3,-2). Write the equation of the line in standard form

A. $x + 2y = 5$

B. $y + 2 = \frac{1}{2}(x + 3)$

C. $x - 2y = 1$

D. $y = \frac{1}{2}x - \frac{1}{2}$

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

$y - (-2) = \frac{1}{2}(x - (-3))$

$y + 2 = \frac{1}{2}(x + 3)$

$y + 2 = \frac{1}{2}x + \frac{3}{2}$

$-2 \quad -2$

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

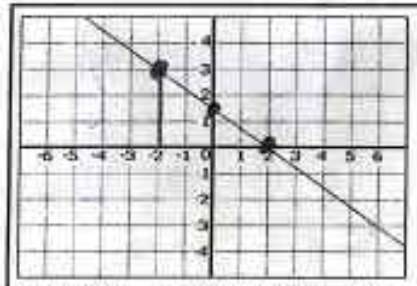
·2 ·2 ·2

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

$2y = 1x - 1$

$-1x + 2y = -1$

$1x - 2y = 1$



Write the equation of the line above in standard form.

A. $4x + 3y = -8$

B. $4x + 3y = 8$

C. $3x - 4y = 6$

D. $3x + 4y = 6$

$b = 1.5$

$m = -\frac{3}{4}$

·4 ·4 ·4

$y = -\frac{3}{4}x + 1.5$

$4y = -3x + 6$

$3x + 4y = 6$

Unit 6

Interpreting Functions

ALGEBRA 1

The altitude of a plane above sea level, in feet, m minutes after departure is $293 + 400m$

Which statement is correct?

A. The plane's altitude increases by 293 feet each minute after departure.

B. The plane's altitude decreases by 293 feet each minute after departure.

C. The plane's altitude decreases by 400 feet each minute after departure.

(D.) The plane's altitude increases by 400 feet each minute after departure.

m changes. Rate of change

A pizza buffet has prepared 21 pizzas to place on the line at the beginning of lunch at 11:00 a.m. The equation used to describe the total number of pizzas that have been placed out on the buffet line is shown below.

$$y = 17x + 21$$

If x represents every 8 minutes after 11:00 a.m, which statement best describes the rate of change in the number of pizzas set out on the buffet?

A. Every 8 minutes, 27 more pizzas were set out on the buffet.

(B.) Every 16 minutes, 34 more pizzas were set out on the buffet.

C. Every 16 minutes, 44 more pizzas were set out on the buffet.

D. Every 16 minutes, 17 more pizzas were set out on the buffet.

$17 \times 2 = 34$

$x = 8$ min

$2x = 16$ min

Which statement describes the rate of change of the following function?

$f(x) = 3x - 9$

A. The function has a varying rate of change when $x < 9$.

(B.) The function has a constant rate of change, increasing for all x at a rate of 3.

C. The function has a varying rate of change when $x > 3$.

D. The function has a constant rate of change, decreasing for all x at a rate of 9.

3 is slope, so it's the rate of change. It's constant.

Adelaide has a credit card with a company that charges $2.00 for every day a payment is late. If she paid $604.10 for a bill that is 4 days late, how much was the bill without the late fee?

A. $596.10
B. $602.10
C. $594.10
D. $598.10

Total = $604.10

4 days late. $2 per day, so,

$4 \times 2 = \$8.00$

$604.10 - 8.00 = 596.10$

Water is leaking out of a container. At 2:30 p.m., there are 35 pints of water in the container. At 4 p.m., there are 23 pints of water in the container.

If the water continues leaking out of the container at the same rate, how much water will be in the container at 6:30 p.m.?

A. 19 pints
B. 18 pints
C. 3 pints
D. 43 pints

2.5

$\frac{23-35}{4-2.5} = \frac{-12}{1.5} = -8$

4 → 6:30 = 2.5 hours → $-8 \times 2.5 = -20$

$23 - 20 = 3$

The total number of credit hours that remain for a student to earn a degree after s semesters have been completed successfully is given by $130 - 15s$. Which statement is correct?

decrease → Rate of change (15)

A. The remaining credit hours increase by 130 for each semester completed.
B. The remaining credit hours decrease by 15 for each semester completed.
C. The remaining credit hours decrease by 130 for each semester completed.
D. The remaining credit hours increase by 15 for each semester completed.

Sending text messages from Katrina's cell phone costs $0.16 per text message. From last month, she has a credit on her bill for $8.00. How much more money will she need to pay for text messages this month if she has sent 207 messages?

A. $25.12
B. $26.02
C. $33.12
D. $23.12

$0.16x - 8.00$

$0.16(207) - 8.00 = 25.12$