MAY 15, 2017

**UNIT 3: LINEAR RELATIONS
              AND FUNCTIONS**

**SECTIONS 5.6 AND 5.7:
"PROPERTIES OF LINEAR
RELATIONS" AND
"INTERPRETING GRAPHS
OF LINEAR FUNCTIONS"**

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NUMBERS, RELATIONS AND FUNCTIONS 10

WHAT'S THE POINT OF TODAY'S LESSON?

We will continue working on the NRF 10 Specific Curriculum Outcome (SCOs) "Relations and Functions 4 and 5" OR "RF4 and RF5" which state:

RF4: "Describe and represent linear relations using: words, sets of ordered pairs, tables of values, graphs and equations."

AND

RF5: "Determine the characteristics of the graphs of linear relations including the: intercepts, slope, domain and range."

What does THAT mean???

SCO RF4 means that we will:
* identify independent and dependent variables in a given context
* determine whether a situation, a graph, a table of values, a set of ordered pairs or an equation represents a linear relation, and explain why or why not
* draw a graph from a set of ordered pairs within a given situation, and determine whether the relationship between the variables is linear
* match corresponding representations of linear relations

What does THAT mean???

SCO RF5 means that we will:

*   determine the intercepts of the graph of a linear relation, and state the intercepts as values or ordered pairs
*   determine the slope, domain and range of the graph of a linear relation
*   sketch a linear relation that has one intercept, two intercepts or an infinite number of intercepts
*   identify the graph that corresponds to a given slope and y-intercept
*   determine the slope and y-intercept that corresponds to a given graph
*   solve a contextual problem that involves intercepts, slope, domain or range of a linear relation

YOU TRY!

Volume of Gas in a Scooter
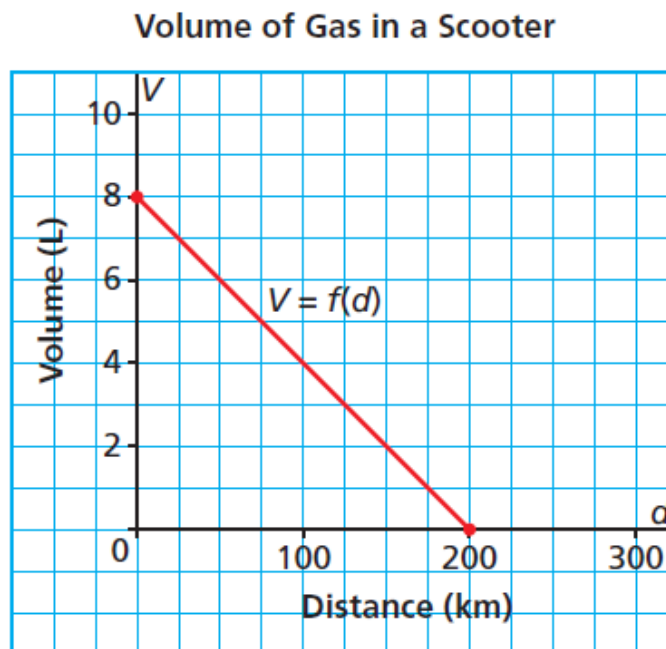
a) **Where does the graph intersect the vertical axis (y-intercept)? What does this point represent?**
b) **Where does the graph intersect the horizontal axis (x-intercept)? What does this point represent?**
c) **What is the rate of change for this graph? What does it represent?**
d) **What is the domain of the graph? The range?**

SOLUTION:

a) **8 or (0 , 8); this represents the volume of gas in the scooter at the beginning of the trip (8L).**
b) **200 or (200 , 0); this represents the distance the scooter traveled (200 km).**
c) **Rate of change = rise / run**

$$= \frac{-8L}{200 \text{ km}}$$

$$= -0.04 \text{ L / km}$$

Every Km, he burns 0.04 L of gas.

d) **{d | 0 ≤ d ≤ 200, d ∈ R}   {V | 0 ≤ V ≤ 8, V ∈ R}**

We can use the intercepts to graph a linear function written in function notation.

To determine the y-intercept, evaluate $f(x)$ when $x = 0$, that is, evaluate $f(0)$.

To determine the x-intercept, determine the value of x when $f(x) = 0$.

(y)

$f(x) = x - 3$

$f(x) = 0$, or x-intercept

$f(0)$, or y-intercept
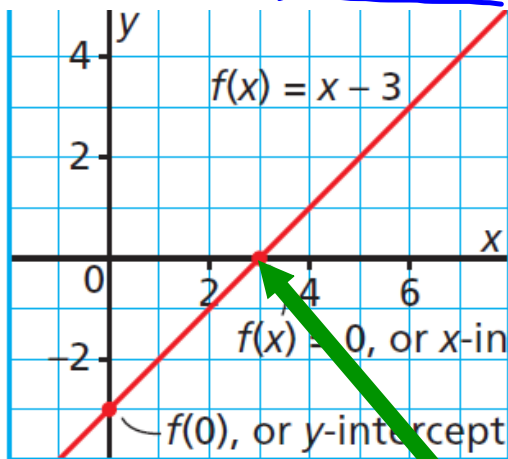
The x-coordinate of the point where a graph intersects the x-axis is called the **x-intercept**, or the **horizontal intercept**.

It is the value of x when f(x) = 0 [or when "y" = 0].

We can use the intercepts to graph a linear function written in function notation.

To determine the y-intercept, evaluate $f(x)$ when $x = 0$; that is, evaluate $f(0)$.

To determine the x-intercept, determine the value of x when $f(x) = 0$.
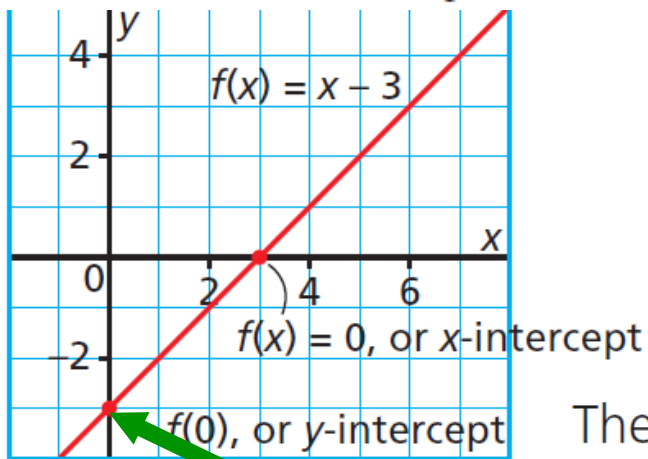
The y-coordinate of the point where a graph intersects the y-axis is called the **y-intercept**, or the **vertical intercept**.

It is the value of f(0) (or "y" when x = 0).

EXAMPLE:

Sketch a graph of the linear function $f(x) = 4x - 3$. $(y = mx + b)$

x-intercept: **y-intercept:**   **3rd point on line:**

$f(x) = 4x - 3$

$0 = 4x - 3$

$3 = 4x$

$\frac{3}{4} = x$

$(\frac{3}{4}, 0)$

$f(x) = 4x - 3$

$f(0) = 4(0) - 3$

$f(0) = -3$

$(0, -3)$

$f(x) = 4x - 3$

$f(1) = 4(1) - 3$

$f(1) = 1$

$(1, 1)$

SOLUTION:

Sketch a graph of the linear function $f(x) = 4x - 3$.

The graph shows the line $f(x) = 4x - 3$ plotted on a coordinate grid with x-axis labeled -2, 0, 2, 4 and y-axis labeled 2, -2.
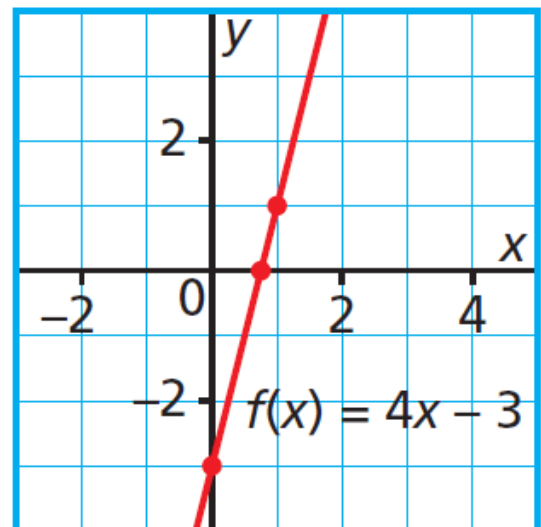
YOU TRY!

Sketch a graph of the linear function $f(x) = -2x + 7$.

x-intercept: **y-intercept:** **3rd point on line:**

$f(x) = -2x + 7$

$0 = -2x + 7$

$-7 = -2x$

$\frac{7}{2} = x$

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

$f(x) = -2x + 7$

$f(0) = -2(0) + 7$

$f(0) = 7$

$(0, 7)$

$f(x) = -2x + 7$

$f(1) = -2(1) + 7$

$f(1) = 5$

$(1, 5)$

SOLUTION:

Sketch a graph of the linear function $f(x) = -2x + 7$.

$f(x) = -2x + 7$
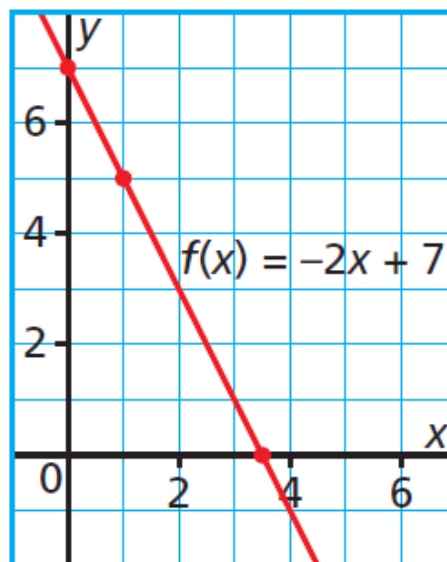
EXAMPLE:

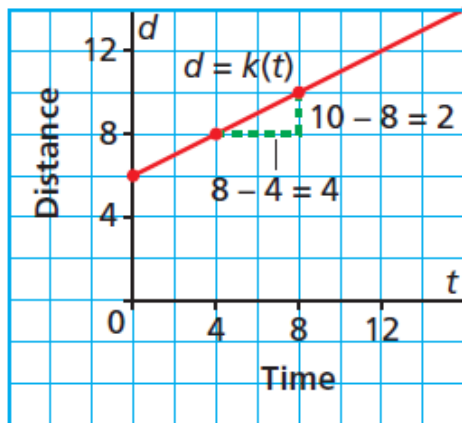"m" (slope)

y-int "b"

Which graph has a ~~rate of change~~ of $\frac{1}{2}$ and a ~~vertical intercept~~ of 6? Justify the answer.

a)

b) ✱
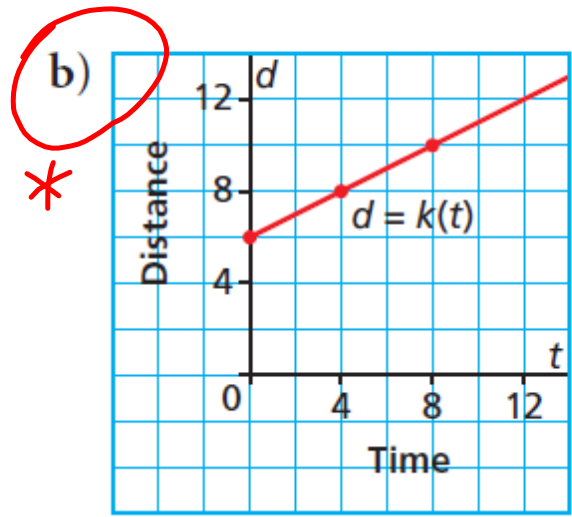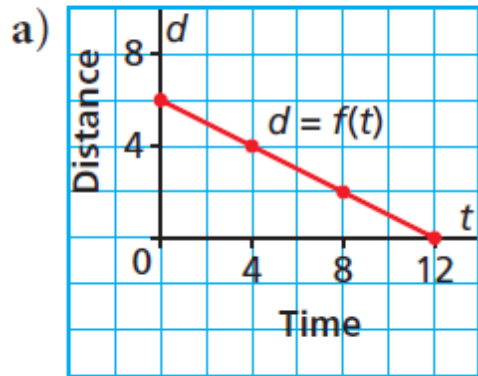
SOLUTION:

The graph of $d = k(t)$ has a vertical intercept of 6.

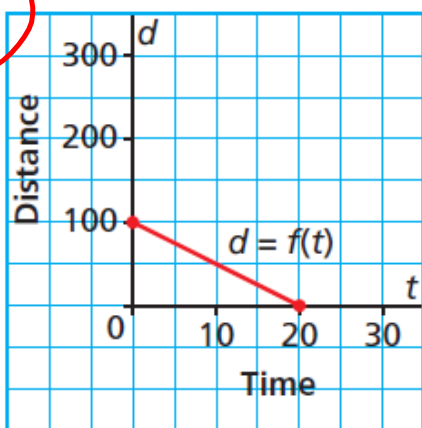The rate of change is: $\dfrac{2}{4} = \dfrac{1}{2}$

So, this is the correct graph.

YOU TRY!

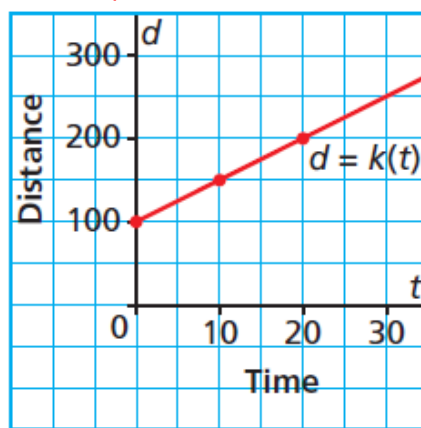Which graph has a rate of change of −5 and a vertical intercept of 100? Justify your answer.

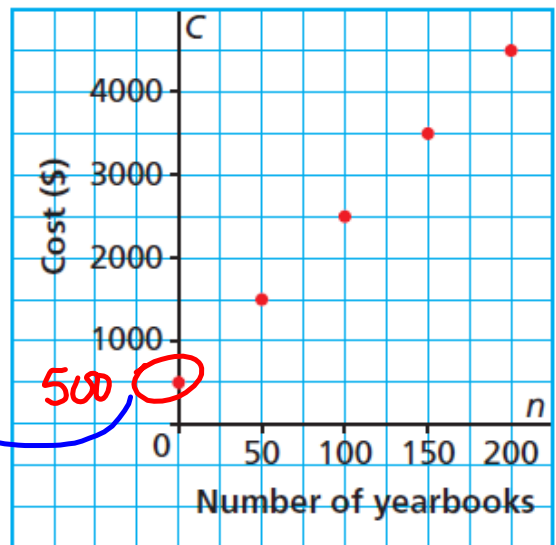$m = -5$ (＼)

a)

✱

$d = f(t)$

b)

$d = k(t)$

EXAMPLE: Solving a problem involving a linear function

This graph shows the cost of publishing a school yearbook
for Collège Louis-Riel in Winnipeg.

Cost of Publishing a Yearbook

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

$$= \frac{1000}{50}$$

$$= \$20/yrbook$$

"b"

500

$$C = 20n + 500$$

The budget for publishing costs is $4200. What is the maximum
number of books that can be printed?

$$C = 20n + 500$$
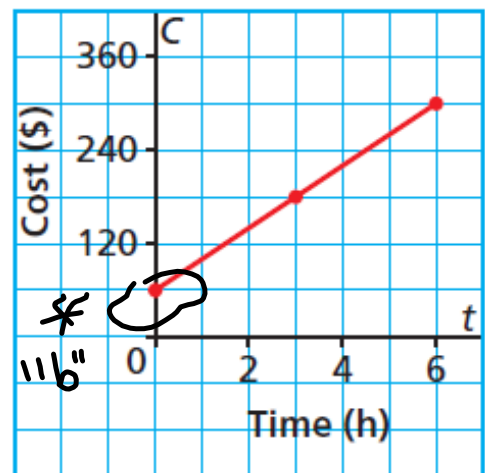$$4200 = 20n + 500$$
$$3700 = 20n$$
$$185 = n$$

YOU TRY!

This graph shows the total cost for a house call by an electrician for up to 6 h work.

The electrician charges $190 to complete a job. For how many hours did she work?

Cost of an Electrician's House Call

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

$$= \frac{120}{3}$$

$$= \$40/hr$$

$$C = 40h + 60$$

$$190 = 40h + 60$$

$$130 = 40h$$

$$\frac{13}{4} = h$$

$$3\tfrac{1}{4} = h$$

[Answer: $3\frac{1}{4}$ h]

CONCEPT REINFORCEMENT:

FPCM 10:
Page 308:   **#3, #4, #5 and #7**
Page 309:   #12 & #14

Attachments

Worksheet - Function Notation.pdf