

# FMP 10

## Linear Relations & Functions Practice Test

Name: \* Key

Date: \_\_\_\_\_

Learning Goals	Novice	Apprentice	Expert
I will be able to explain the relationships among data and graphs			
I will be able to show an understanding of slope, lines, rate of change, parallel lines, perpendicular lines			

### Learning Goal #1: I will be able to explain the relationships among data and graphs

Novice	
<p>Circle the graph that represents a function?</p>	<p>A person in a car drives away from a stop sign, cruises at a constant speed, and then slows down as she approaches another stop sign. Circle the graph that best represents this situation?</p>
<p>This graph shows the height of the tide in a harbour as a function of time in one day. What is the greatest height of the tide?</p>	<p>This graph shows a person's distance from a starting point, <math>d</math> kilometres, as a function of time, <math>t</math> minutes. Determine the distance from the starting point when the time is 5 min.</p>

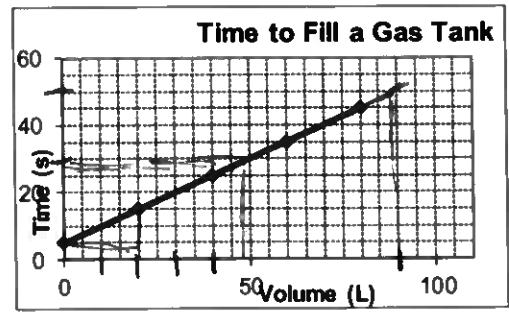
Apprentice	
<p>For the function <math>f(x) = -3x + 7</math>, determine <math>f(-2)</math>.</p> <p><math>-3(-2) + 7</math>  <math>6 + 7</math>  <math>13</math></p>	<p>Which situation represents a linear relation? Circle the correct scenarios.</p> <ol style="list-style-type: none"> <li>The number of cells decays at a rate of 12% each day.</li> <li><input checked="" type="checkbox"/> A taxi company charges a \$3 flat fee plus \$1 for each kilometre travelled.</li> <li>A population of bacteria doubles every hour for 6 h.</li> <li>An investor's portfolio increases in value by 6% each year.</li> </ol>

The altitude of a plane,  $a$  metres, is related to the time,  $t$  minutes, that has elapsed since it started its ascent. Determine the rate of change of this linear relation.

$t$ (min)	0	2	4	6	8
$a$ (m)	4000	5400	6800	8200	9600

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5400 - 4000}{2 - 0} = \frac{1400}{2} = 700 \text{ m/min}$$

What is the rate of change of the below scenario?



$$y = \frac{1}{2}x + 5$$

About how long will it take to fill a 45-L gas tank?

27.5 sec

What volume can you fill in 30 minutes seconds?

47.5 - 50L ~~47.5 - 50L?~~

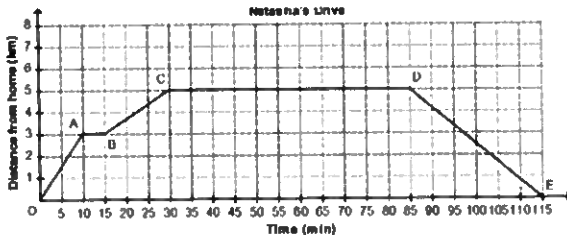
How long would it take to fill a 90L tank?

$$90 = \frac{1}{2}x + 5 \implies 85 = \frac{1}{2}x \implies x = 170 \text{ sec.}$$

Natasha spent part of the afternoon running errands. This graph shows her distance from home as a function of time.

How far did Natasha drive in total? 5km

How long was Natasha away from home? 115 min

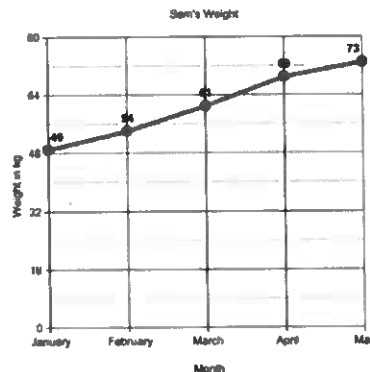


**Expert**

For the function  $g(x) = 4x - 3$ , determine  $x$  when  $g(x) = -15$ .

$$g(-15) = 4(-15) - 3 = -60 - 3 = -63$$

Create a data table of the below information



$x$ (month)	$y$ (weight)
Jan	49
Feb	54
March	61
April	69
May	73

Determine the domain and range of the graph of this function.

Express DOMAIN in BOTH forms:

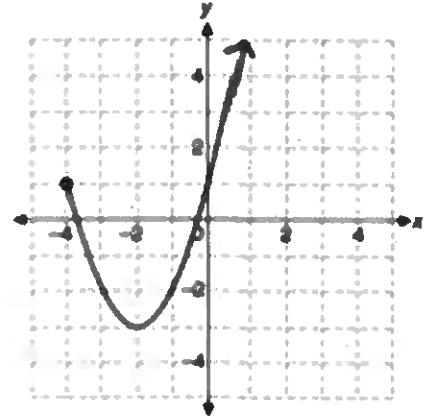
Set:  $\{x \mid -4 \leq x < \infty\}$

Interval:  $[-4, \infty)$

Express RANGE in BOTH forms:

Set:  $\{y \mid -3 \leq y < \infty\}$

Interval:  $[-3, \infty)$



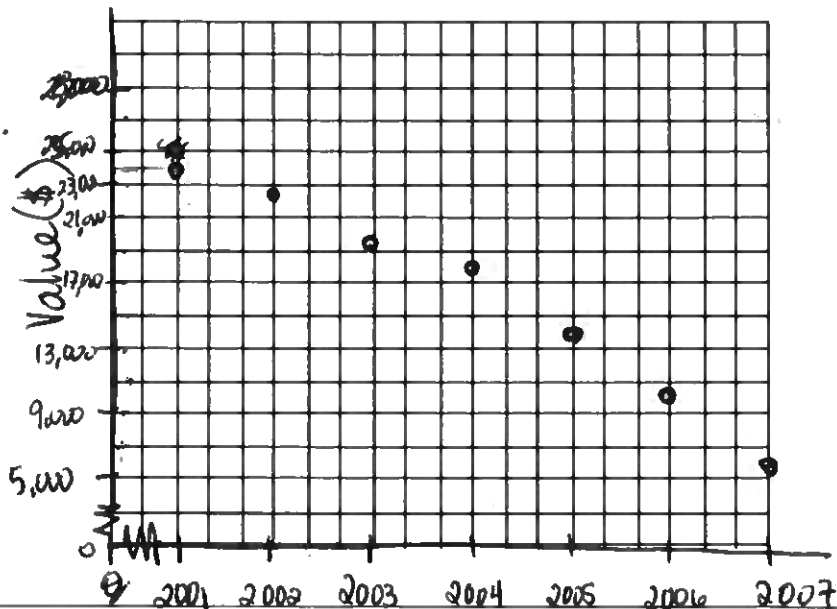
Josh buys a new car in 2001. In 2010 he is trying to figure out how much he wants to sell it for. He found information on how much his car was worth until 2007. Graph the data and estimate how much the car is worth in 2010. Justify your answer.

Value of Josh's Car.

Value to Josh's Car

Year	Value
2001	\$24,000
2002	\$22,500
2003	\$19,700
2004	\$17,500
2005	\$14,500
2006	\$10,000
2007	\$ 5,800

$1500/\text{yr.}$   
 $2800$   
 $2200$   
 $3000$   
 $4,500$   
 $4200$   
 $\sim 3900$   
 $3700$



$y = mx + b$   
 $b = 24,000 - \text{Year}$   
 $m = -$

$\sim$  I estimate  $\sim$  \$1000. in 2010. The car is depreciating quickly, but it can't go below zero. It will stay stagnant at \$1000.

**Learning Goal #2: I will be able to show an understanding of slope, lines, rate of change, parallel lines, perpendicular lines**

**Novice**

The slope of a line is  $-\frac{4}{7}$ .

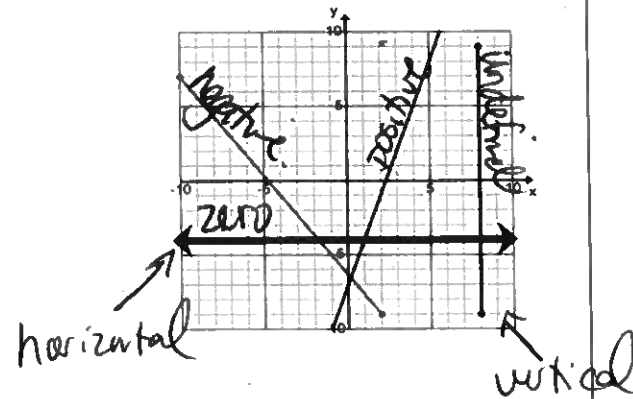
What is the slope of a line that is perpendicular to this line?

$$m = \frac{7}{4}$$

What is the slope of a line that is parallel to this line?

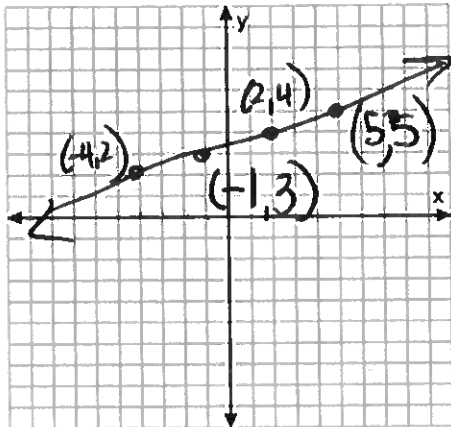
$$m = -\frac{4}{7}$$

Label the below four slopes with positive, negative, zero, and undefined.

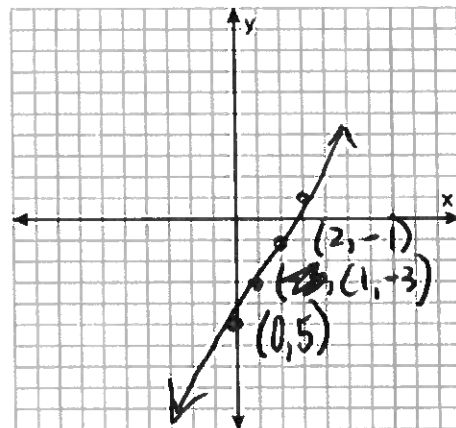


Graph the line  $y - 2 = \frac{1}{3}(x + 4)$

$(-4, 2)$



Graph the line  $y = 2x - 5$



**Apprentice**

A line has x-intercept  $-7$  and y-intercept  $5$ . Determine the slope of a line **parallel** to this line.

$(-7, 0)$   
 $(0, 5)$

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

$$= \frac{5 - 0}{0 + 7} = \frac{5}{7}$$

$$m = \frac{5}{7}$$

A line passes through the point  $(-2, 4)$  and  $(3, 5)$ . What is the slope **perpendicular** to this slope?

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

$$= \frac{5 - 4}{3 + 2}$$

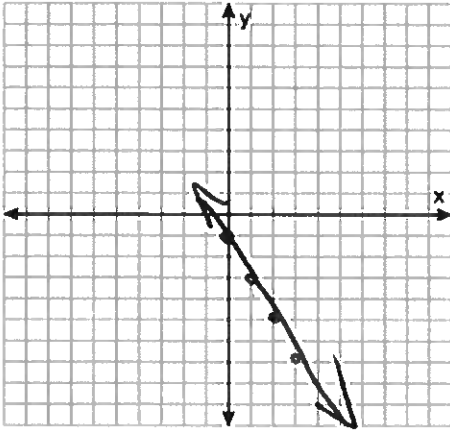
$$= \frac{1}{5}$$

$$m = -5$$

Graph the line  $4x + 2y + 2 = 0$

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

$$y = -2x - 1$$



A line that passes through  $(8, -3)$  and perpendicular to  $y = -4x - 7$ . Write in slope-intercept form.

$$m = \frac{1}{4}$$

$$y + 3 = \frac{1}{4}(x - 8)$$

$$y - 3 = \frac{1}{4}x - 2$$

$$y = \frac{1}{4}x - 5$$

### Expert

A line has a slope of  $-\frac{3}{10}$  and a y-intercept of  $-8$ .

Write the equation of the line in the below forms:

Slope-intercept form  $y = -\frac{3}{10}x - 8$

$$(0, -8) \quad y + 8 = -\frac{3}{10}(x + 0)$$

$$y + 8 = -\frac{3}{10}x - 8$$

General form  $3x + 10y + 80 = 0$

$$y + 8 = -\frac{3}{10}x \quad \left| \cdot 10 \right. \quad \left( \frac{3}{10}x + y + 8 = 0 \right)$$

A line with a y-intercept  $-4$  and perpendicular to the line passing through  $(-5, 7)$  &  $(3, -1)$ . Write in general form.

$$(0, -4)$$

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

$$= \frac{-1 - 7}{3 + 5} = \frac{-8}{8} = -1$$

$$m = 1$$

$$y + 4 = 1(x - 0)$$

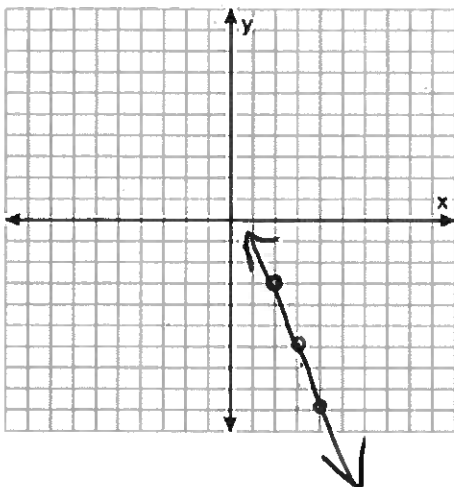
$$y + 4 = x$$

$$-1(-x + y + 4 = 0)$$

$$x - y - 4 = 0$$

Graph the line that is perpendicular to  $y + 4 = \frac{1}{3}(x - 1)$  and goes through the point  $(2, -3)$

$$m = -3$$



A line that has the same y-intercept as  $4x - 3y = 12$  and parallel to  $5x + 15y - 25 = 0$ . Write in the below forms:

$$4x - 3y = 12$$

$$-4x \quad -4x$$

$$-3y = -4x + 12$$

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

$$5x + 15y - 25 = 0$$

$$15y = -5x + 25 \quad \left| \div 15 \right. \quad y = -\frac{1}{3}x + \frac{5}{3}$$

Slope-intercept form

$$b = -4$$

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

$$y = -\frac{1}{3}x - 4$$

General Form:

$$3\left(\frac{1}{3}x + y + 4 = 0\right)$$

$$x + 3y + 12 = 0$$

