

**PRE-TEST \_\_\_\_\_ MTH4109 Sets, Relations and Functions**

**Question 1**

A car travels at a constant speed of 110 Km/hour between Montreal and Toronto.

Determine the independent variable for this functional situation.

Answer: \_\_\_\_\_

**Question 2**

A function is described by the following rule:

$$f(x) = \frac{7x}{2} - 5$$

- a) Determine over which interval the function is negative.

Answer: \_\_\_\_\_

- b) Determine the rate of change of this function.

Answer: \_\_\_\_\_

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**Question 3**

Use set-builder notation to define the relation illustrated below.

Answer: \_\_\_\_\_

**Question 4**

The graph below represents situation  $f(x)$ . Determine the following characteristics of this function.

- a) Domain: \_\_\_\_\_
- b) Range: \_\_\_\_\_
- c) An interval over which the function is both increasing and negative:  
\_\_\_\_\_
- d)  $f(-2) =$  \_\_\_\_\_
- e) The maximum of  $f(x)$  : \_\_\_\_\_

**Question 5**

A function is described by the following rule:

$$f(x) = 2x^2 - 3$$

- a) Determine the interval over which this function is positive.

Answer: \_\_\_\_\_

- b) Determine the interval over which this function is increasing.

Answer: \_\_\_\_\_

**Question 6**

Given the following sets:

$$A = \{x \in R \mid x \leq 3\}$$

$$B = \{x \in R \mid -2 \leq x \leq 5\}$$

Perform the following set operations:  $(A \cap B)'$

Graph the detailed solution below.

Give your answer in interval notation: \_\_\_\_\_

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**Question 7**

Given the following intervals:

$$A = [ 2, 7 ]$$

$$B = ] -4, 4 ]$$

$$C = [ 0, 8 ]$$

Perform the following set operations:  $(B \cap C) \setminus A$

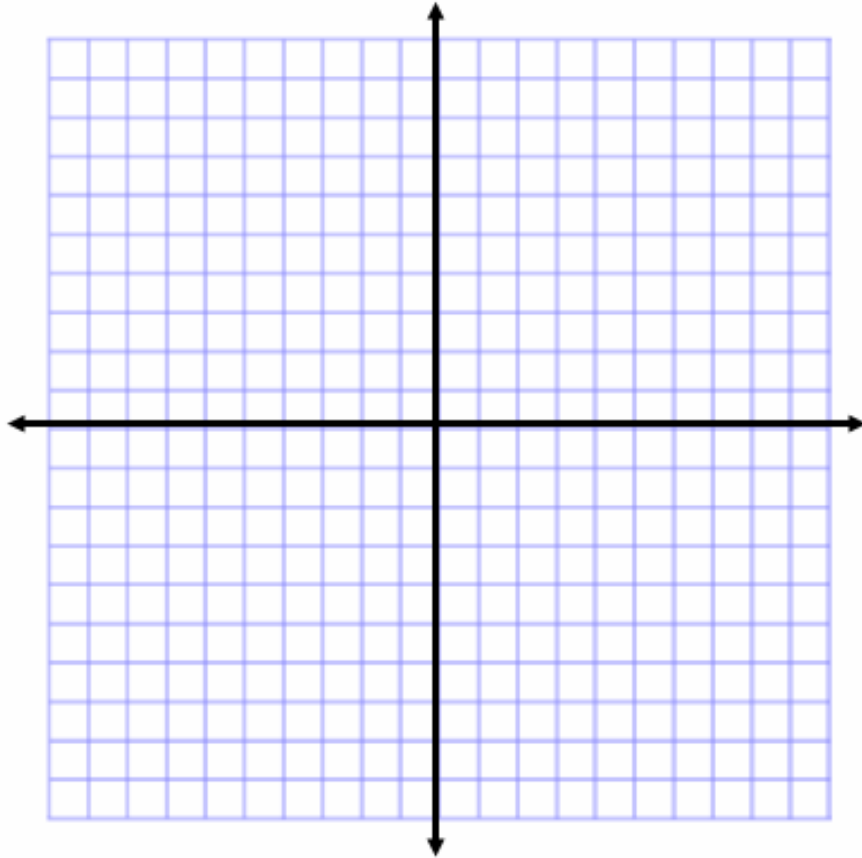
Graph the detailed solution below:

Give your answer in set-builder notation: \_\_\_\_\_

**Question 8**

Graph the following relation in a Cartesian plane:

$$R = \{(x, y) \in \mathbb{R} \times \mathbb{R} \mid 3x - 2y + 5 > 0\}$$



Determine the domain and range.

Domain = \_\_\_\_\_ Range = \_\_\_\_\_

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Question 9

While playing no-limit Texas Hold'em poker, you are down to 30\$ in chips. There are 15 000\$ of chips in play. In order to win, you will have to double your chips several times in a row.

a) Complete the following table of values:

x (Number of Double-ups)	0	1	2	3	4	5	6	7
f(x) (Chip total)	30\$	60\$						

b) Graph this functional situation.



c) Is the function increasing or decreasing? Answer: \_\_\_\_\_

Explain your answer: \_\_\_\_\_

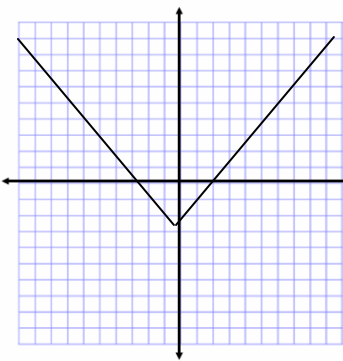
d) What is the range of this function?

Answer: \_\_\_\_\_

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**Question 10**

Six representations are given below.

<p><b>A</b></p> $f(x) = 2x - 3$	<p><b>B</b></p> <p><math>g(x)</math> = The image of an element obtained by subtracting 3 from twice this element.</p>	<p><b>C</b></p> <table border="1"> <thead> <tr> <th>x</th> <th>h(x)</th> </tr> </thead> <tbody> <tr><td>-5</td><td>22</td></tr> <tr><td>-4</td><td>13</td></tr> <tr><td>-3</td><td>6</td></tr> <tr><td>-2</td><td>1</td></tr> <tr><td>-1</td><td>-2</td></tr> <tr><td>0</td><td>-3</td></tr> <tr><td>1</td><td>-2</td></tr> <tr><td>2</td><td>1</td></tr> <tr><td>3</td><td>6</td></tr> <tr><td>4</td><td>13</td></tr> <tr><td>5</td><td>22</td></tr> </tbody> </table>	x	h(x)	-5	22	-4	13	-3	6	-2	1	-1	-2	0	-3	1	-2	2	1	3	6	4	13	5	22
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<p><b>D</b></p> $i(x) = x^2 - 3$	<p><b>E</b></p> <table border="1"> <thead> <tr> <th>x</th> <th>j(x)</th> </tr> </thead> <tbody> <tr><td>-5</td><td>-13</td></tr> <tr><td>-4</td><td>-11</td></tr> <tr><td>-3</td><td>-9</td></tr> <tr><td>-2</td><td>-7</td></tr> <tr><td>-1</td><td>-5</td></tr> <tr><td>0</td><td>-3</td></tr> <tr><td>1</td><td>-1</td></tr> <tr><td>2</td><td>1</td></tr> <tr><td>3</td><td>3</td></tr> <tr><td>4</td><td>5</td></tr> <tr><td>5</td><td>7</td></tr> </tbody> </table>	x	j(x)	-5	-13	-4	-11	-3	-9	-2	-7	-1	-5	0	-3	1	-1	2	1	3	3	4	5	5	7	<p><b>F</b></p> 
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Three of these representations correspond to the same function  $f_1$  and two of them correspond to another function  $f_2$ .

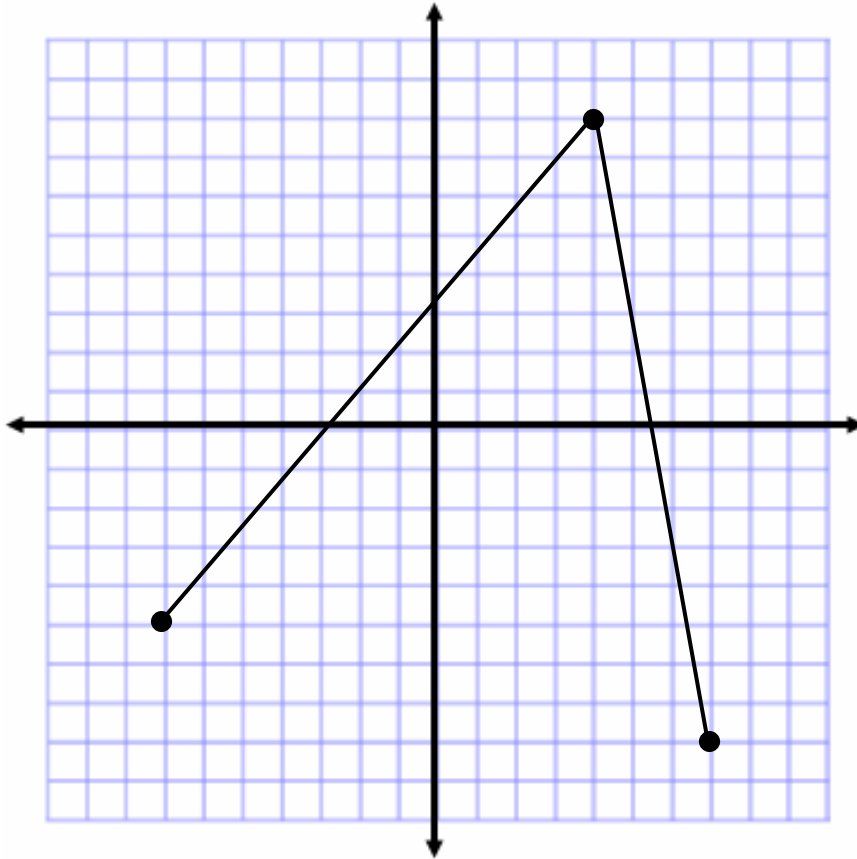
Indicate which representations correspond to each function,

$f_1$ : \_\_\_\_\_

$f_2$ : \_\_\_\_\_

**Question 11**

The following graph represents functional situation f.



Indicate whether each of the following statements is true or false.

- a) The function has a minimum and two maximums. \_\_\_\_\_
- b) The domain is  $] -7, 7 [$  \_\_\_\_\_
- c) The function has no axis of symmetry. \_\_\_\_\_
- d) The y-intercept is (0,4) \_\_\_\_\_



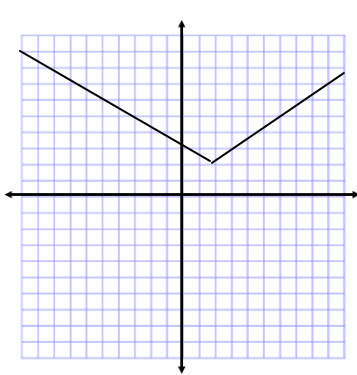
**Question 12**

Function  $f$  has all of the following characteristics:

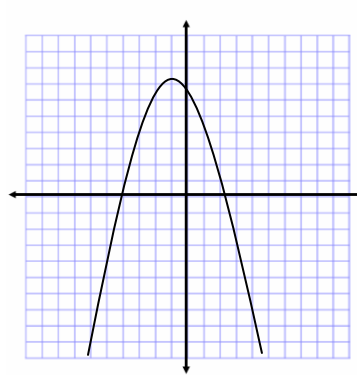
- It has a minimum.
- It has no zeroes.
- It is increasing over its entire domain.

Which of the following graphs could represent function  $f$ ?

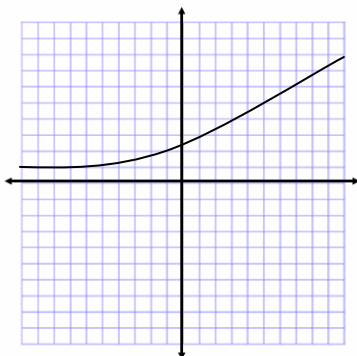
A.



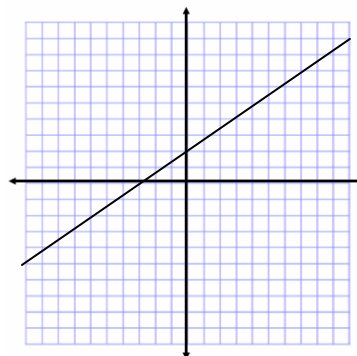
B.



C.



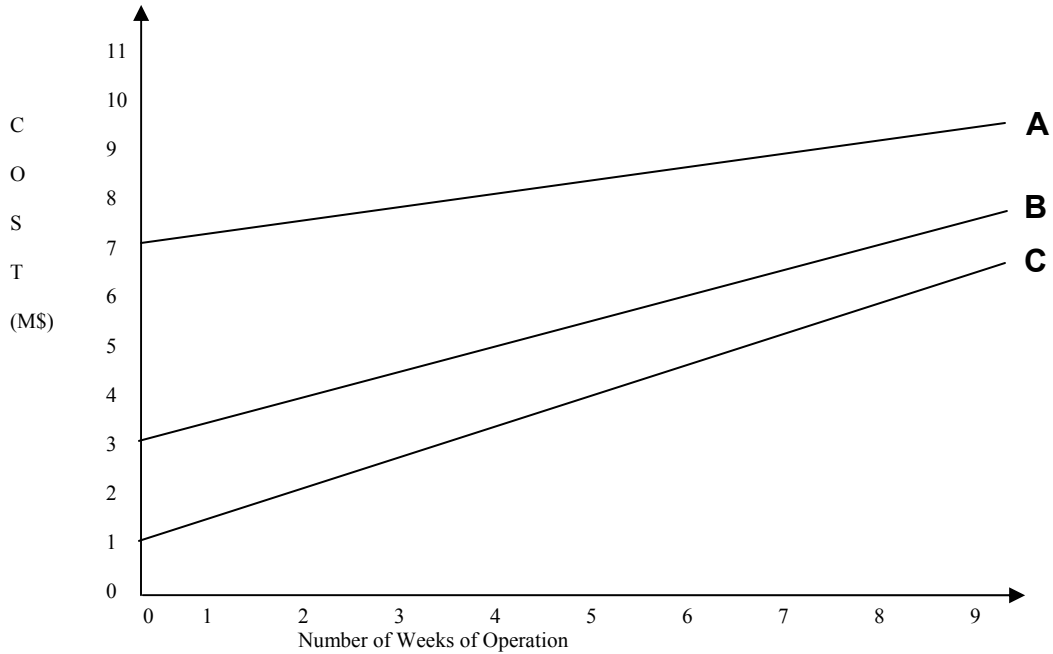
D.



Answer: \_\_\_\_\_

**Question 13**

An accounting firm decides to compare the operating costs of three paper producing companies that are their clients. The graphs below represent each company's costs per week:

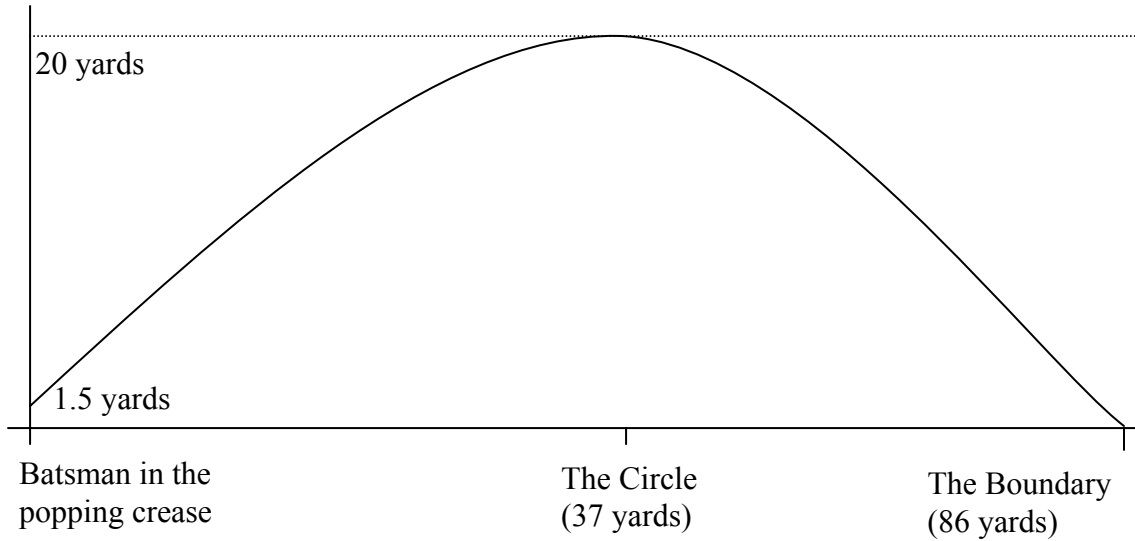


Which company will have the highest operating costs after 26 weeks?

Clearly show all your work.

**Question 14**

During a cricket match, a batsman hits a ball that reaches a maximum height of 20 yards at the edge of the circle (37 yards away from him). If the ball was initially hit at a height of 1.5 yards, will it make the boundary (86 yards away from him) and score him 6 runs?



Clearly show all your work.

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**Question 15**

Two model rocket enthusiasts, George and Henry, have figured out that the equations that will represent their rocket's altitude in meters are:

$$G(t) = -t^2 + 30t$$

$$H(t) = -t^2 + 36t - 100$$

where  $t$  represents the time in seconds after launch.

Which rocket reached the highest altitude? Clearly show all your work.