

Grade 9 Academic Math  
Unit 3 – Analytic Geometry – Major Test

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Victim: Mr. Solutions

Another brilliant  
result Mr. S.!

KU	APP	TIPS	COM
13/13	23/23	14/14	10/10

**Modified True/False (3 KU)**

Indicate whether each statement is **true** or **false**. If false, **change** the underlined part to make the statement true.

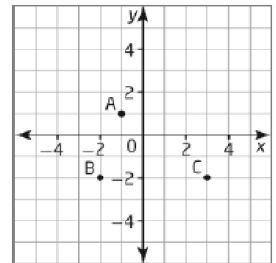
- F **Partial** variation occurs when the ratio of the dependent variable to the independent variable is constant. ✓ = 1/2 mark **Change:** Direct ✓
- F The **vertical intercept**, constant of variation and rate of change all represent the same concept for a linear relation. **Change:** slope ✓
- F Any linear relation has an equation of the form  $y = mx + b$ , where  $m$  represents the **fixed, or initial value of y** and  $b$  represents the vertical intercept. **Change:** slope ✓   
 or constant of variation

**Multiple Choice (5 KU)**

For questions 4 to 8, select the **best** answer. Write the letter of your choice in the provided blank space.

4. b ✓ Three points are shown at the right. Between which two points can you draw a line with a **negative** slope?

(a) B and C    (b) A and B    (c) A and C    (d) None of these



5. b ✓ Find the slope of the line that passes through the points  $(-1, 9)$  and  $(-5, 2)$ .

(a)  $\frac{7}{6}$     (b)  $\frac{7}{4}$     (c)  $-\frac{7}{4}$     (d)  $-\frac{7}{6}$

$$\frac{\Delta y}{\Delta x} = \frac{2-9}{-5-(-1)} = \frac{-7}{-4}$$

6. d ✓ Use first differences to determine which relation at the right is linear.

(a) Only A.    (b) Only B.    (c) Both A and B.    (d) Neither

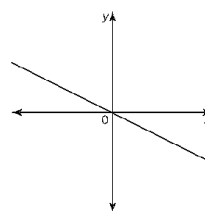
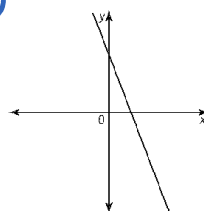
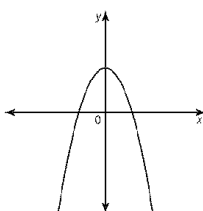
A		B	
x	y	x	y
0	7	1	2
2	2	2	4
4	-4	4	6
6	-10	5	8

7. a ✓ Which of the following equations represents a partial variation?

(a)  $y = -5x + 8$     (b)  $y = -5x$     (c)  $y = -x^5 + 8$     (d) Both (a) and (c)

8. b ✓ Which of the following graphs represents a partial variation?

(a)    (b)    (c)    (d) Both (a) and (b)



## Full Solutions

Write complete solutions for each of the following problems.

9. Consider the graph given at the right. (5 KU)

(a) Calculate the slope. Write your answer in *fraction* form!

$$m = \frac{0-4}{3-0} \checkmark$$

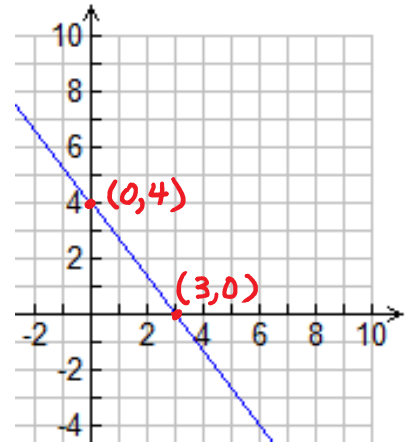
$$= -\frac{4}{3} \checkmark$$

(b) State the y-intercept.

4 ✓

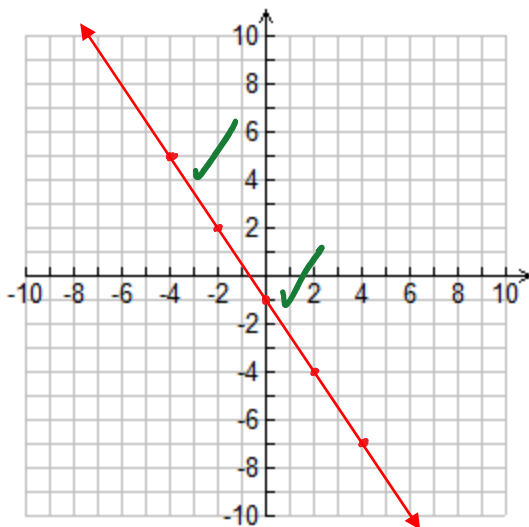
(c) Write an equation for the relation.

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



10. Consider the relation shown at the right in table form. (6 APP)

(a) Represent the relation graphically.



(b) Represent the relation using an equation.

$$m = \frac{-1-5}{0-(-4)} = \frac{-6}{4} = -\frac{3}{2}$$

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

y-intercept

x	y
-4	5
-2	2
0	-1
2	-4
4	-7

(c) Describe the relation in words. (Translate your equation into English.)

The y-co-ordinate is equal to one less than the x-co-ordinate multiplied by  $-\frac{3}{2}$ . ✓



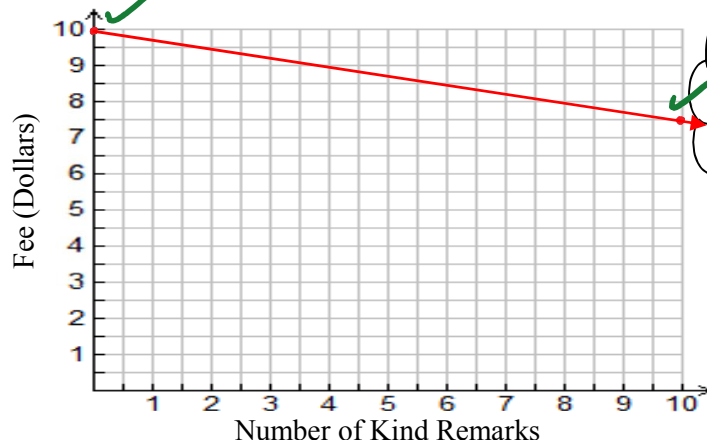
Psst! Mr. Nolfi told me that this question has something to do with

11. Solimon is well known for making inappropriate remarks. To discourage this behaviour, Mr. Nolfi charged Solimon a \$10.00 fee for every class attended. To decrease the amount of money Solimon had to pay, Mr. Nolfi agreed to *reduce* the fee by \$0.25 for every *kind remark* that Solimon made. (10 APP)

(a) Complete the following table.

Number of Kind Remarks Made (n)	Fee (\$) (F)
0	10 ✓
2	9.50 ✓
4	9 ✓
6	8.50 ✓
8	8.00 ✓
10	7.50 ✓

(b) Use the following grid to graph the fee that Solimon must pay versus the number of kind remarks that he makes.



I still don't understand what's wrong with calling my classmates retards and



- (c) Write an equation that relates  $F$  to  $n$ .

$$F = -0.25n + 10$$

OR

$$F = 10 - 0.25n$$

- (d) State the **value** and the **meaning** of the slope as well as the y-intercept.

Slope =  $-0.25$

Meaning: The fee is reduced by \$0.25 per kind remark.

y-intercept =  $10$

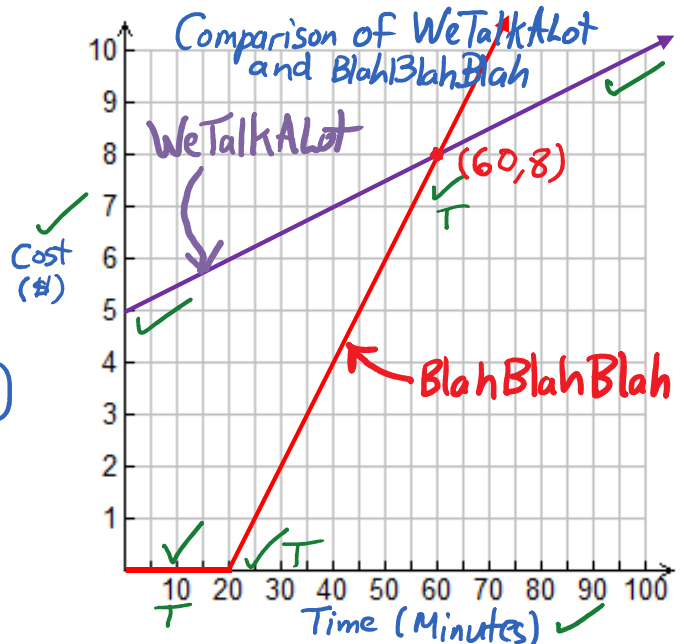
Meaning: Solimon pays \$10 if he doesn't make any kind remarks

12. For long distance calls, the **WeTalkALot** telephone company charges \$5.00 each month plus \$0.05 per minute. The **BlahBlahBlah** telephone company charges nothing for the first 20 minutes each month. However, **BlahBlahBlah** charges \$0.20 for each minute beyond the first 20 minutes.

- (a) Write an equation that relates  $C$  to  $t$  for **WeTalkALot**. Explain how you arrived at the equation. (3 APP)

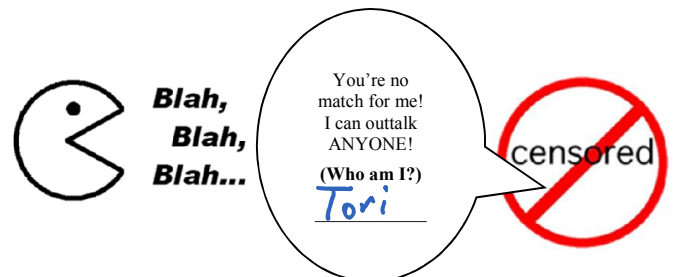
✓ { \$5.00 → initial value (y-intercept)  
 { \$0.05 per minute → rate of change (slope)

$$\therefore C = 0.05t + 5$$



- (b) Use the given grid to sketch a graph of *cost of long distance calls* ( $C$ ) versus *time* ( $t$ ) for **WeTalkALot**. Do not forget to **label** the axes! (4 APP)

- (c) Use the **same** grid to sketch a graph of  $C$  versus  $t$  for **BlahBlahBlah**. (3 TIPS)



- (d) Use your graphs to **estimate** the following: (3 TIPS, 3 COM)

- (i) For what number of minutes do **WeTalkALot** and **BlahBlahBlah** charge the same amount? Explain.

Since the point of intersection is  $(60, 8)$ , both companies charge \$8.00 for 60 minutes of usage.

- (ii) Under what circumstances is **BlahBlahBlah** a better deal? Explain.

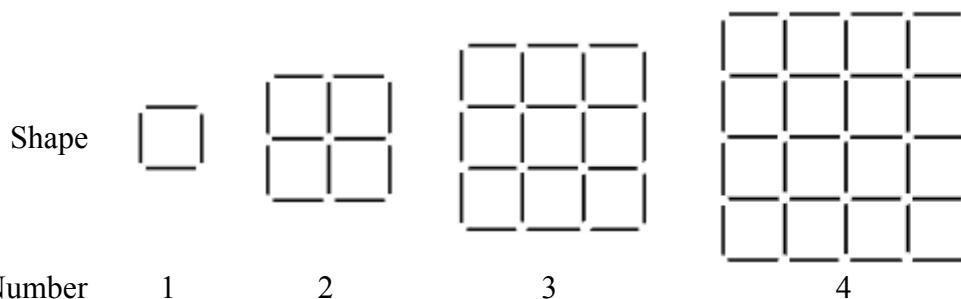
Since the **BlahBlahBlah** graph is lower than the **WeTalkALot** graph for up to 60 minutes, **BlahBlahBlah** is a better deal for less than 60 minutes.

- (iii) Under what circumstances is **WeTalkALot** a better deal? Explain.

Since the **WeTalkALot** graph is lower for more than 60 minutes of usage, **WeTalkALot** is a better deal if the usage is greater than 60 minutes.



14. The shapes shown below are constructed out of toothpicks. (8 TIPS)



(a) Complete the following table.

Diagram Number ( $d$ )	Number of Toothpicks ( $t$ )	First Differences ( $\Delta t$ )
1	4	—
2	12	8
3	24	12
4	40	16

(b) Explain why the relation between  $t$  and  $d$  must be non-linear. In addition, describe how the number of toothpicks increases as the diagram number increases. What pattern do you see?

The relation must be non-linear because the first differences are not constant. Each time the diagram number increases by 1, the number of toothpicks increases by four more than for the previous increase by 1.

(c) Use the pattern that you found in (b) to *predict* the number of toothpicks needed to construct diagrams 5 and 6.

Diagram 5: 60 ✓

Diagram 6: 84 ✓

(d) Write an equation that relates  $t$  to  $d$ . (That is, write an equation that expresses  $t$  in terms of  $d$ .)

$$t = 2d(d+1) \checkmark \checkmark$$

OR

$$t = 2d^2 + 2d$$