CAC CAIRO AMERICAN COLLEGE EGYPT	Name: _____Date : _____ IM 3 UNIT TEST – Linear Functions Teacher: Mr. Santowski and Mr. Smith Score:_____

PART 1 - CALCULATOR ACTIVE QUESTIONS

SHOW ALL WORK AND WRITE ALL ANSWERS IN THE SPACES PROVIDED.

Maximum marks will be given for correct answers. Where an answer is wrong, some marks may be given for correct method, provided the answer is supported by written working. Solutions found from a graphic display calculator should be supported by suitable working, e.g. if graphs are used to find a solution, you should sketch these as part of your answer.

1. In this question, you will work with the linear system defined by the equations $\begin{aligned} 4x-5y-25&=0 \\ y-2&=\frac{1}{2}(x+1) \end{aligned}$.

(8 marks)

a. Use your graphing calculator to determine a GRAPHIC solution to this linear system. Show any algebraic work that was needed in working out your graphic solution.

(2M)

b. State APPROPRIATE window settings that could be used to determine the intersection point.

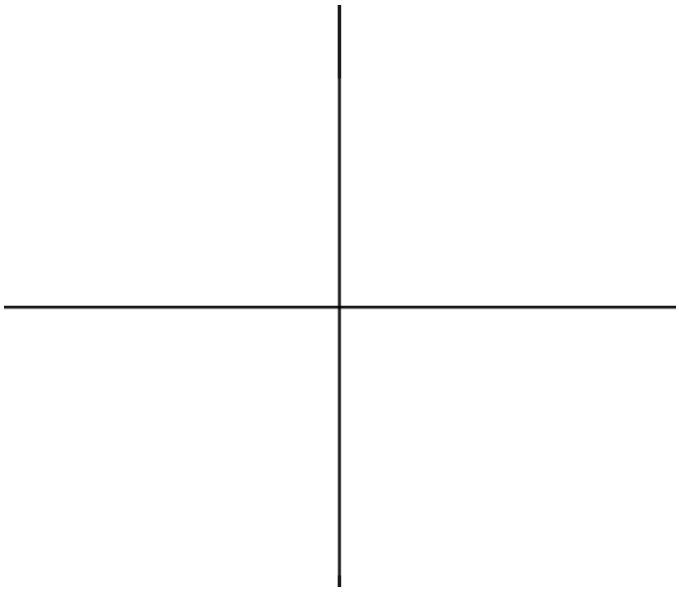
Xmin = Ymin =

Xmax = Ymax =

(2M)

c. Provide a PROPERLY LABELED SKETCH of your linear system on the grid provided. ***Label each function & the intersection point.***

(4M)



2. The following questions deal with determining domains and/or ranges of several functions, working from their equations and/or your TI-84 graphing calculator.

(10 marks)

a. State the range of the linear function $f(x)=3-2x$ given the domain of $\left\{x\in R\middle|-\frac{3}{2}<x\leq\frac{9}{4}\right\}$. Show/explain the key steps of your solution.

(4M)

b. State the domain of the linear function $3x-4y=7$, given the range of $\left\{y\in R\middle|-1\leq y<4\right\}$. Show/explain the key steps of your solution.

(4M)

c. State the range of the function $g(x)=x^2+4x-1$. Show/explain the key steps of your solution.

(2M)

3. ALGEBRAICALLY, verify whether $\left(-3,\frac{11}{2}\right)$ is the solution to the linear system $\begin{array}{l}3x-2y=-20\\2y-3=\frac{5}{3}(x+6)\end{array}$.

SPECIAL NOTE: If no algebraic working is shown, FULL MARKS ARE NOT AWARDED!!!!

(4 marks)

4. Joseph worked two part-time jobs in the summer; one as a math tutor for elementary students and a second job as a piano teacher. He makes $25 per hour as a math tutor and $40 per hour as a piano teacher. Joseph would like to earn a total of $900 in one month of the summer.

(11 marks)

a. Let ***x*** represent the hours he tutors math and let ***y*** represent the hours he teaches piano. On the table provided, determine three (3) combinations of hours worked at his 2 jobs that will earn him $900.

Hours of math tutoring (***x***)	0			
Hours of piano teaching (***y***)		0		

(4M)

b. Write the equation of this linear function in any form of your choosing.

(2M)

c. What is meaning of the slope in this context?

(1M)

d. Mr. S. presents a domain of $\{x \in R \mid 0 \le x \le 900\}$ and explains that he selected this domain because the minimum & maximum amount of money that Joseph could earn was between $0 and $900. Is Mr. S. correct or not. Explain your reasoning.

(2M)

e. Joseph wants to work AT MOST 20 total hours per month. Can he earn his desired total of $900? If not, why not? If yes, how?

(2M)

5. In a biology/chemistry experiment, you are required to make 150 mL of a solution containing 44% hydrochloric acid. To make this mixture, you have two solutions, which you will mix together. You have Solution 1, which contains 40% acid and you have Solution 2, which contains 50% acid. How much of each solution (solution 1 & solution 2) will you mix together to make the required 150 mL of a solution containing 44% hydrochloric acid.

(11 marks)

a. Define your variables, x and y to help write your equations.

(2M)

b. Write the two linear equations that you will use to answer this question.

(2M)

c. Use your graphing calculator (in any way) to solve this system. State your solution.

(1M)

d. Provide an ALGEBRAIC solution to the linear system you defined to answer this word problem.

(4M)

e. State a domain and range that would be reasonable for this context. Explain the reasoning of your domain and range.

(2M)

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PART 2 - CALCULATOR INACTIVE QUESTIONS

SHOW ALL WORK AND WRITE ALL ANSWERS IN THE SPACES PROVIDED.

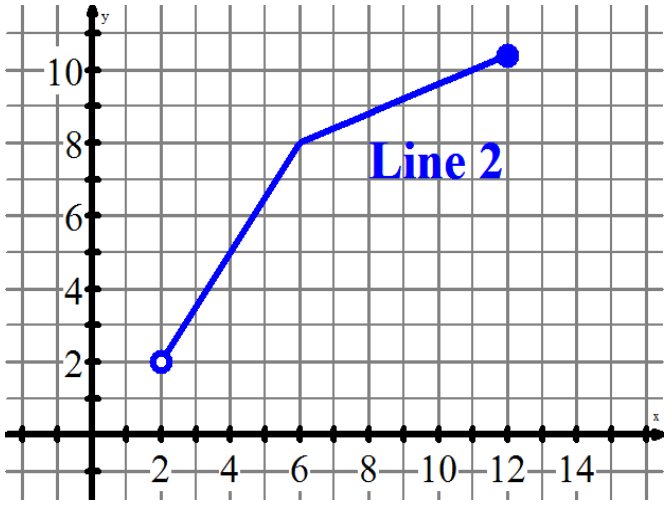
Maximum marks will be given for correct answers. Where an answer is wrong, some marks may be given for correct method, provided the answer is supported by written working.

1. Here is a graph of piecewise function, $y = f(x)$.

(8 marks)

a. State the domain and range of the function as graphed.

(2M)



b. Evaluate $f(4)$.

(1M)

c. Solve for x if $10 = f(x)$.

(1M)

d. State one point on Line 2 of $y = f(x)$

(1M)

e. Calculate the slope of the Line 2

(1M)

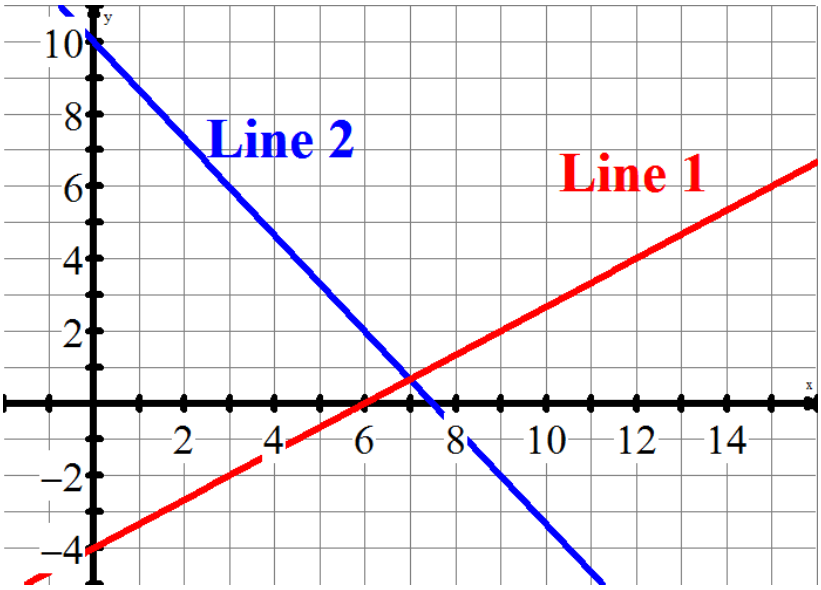
f. Write the equation of Line 2 in standard form.

(2M)

g. Write the equation of this piecewise function. (AP/HL)

2. This question concerns the linear system as graphed in the diagram provided. Use the graph to answer the following questions:

(9 marks)



a. Estimate the solution of this system (in other words, solve $f(x)=g(x)$).

(1M)

b. The equation of Line 1 is $2x-3y-12=0$. Rewrite this equation in function form, $f(x)=mx+b$.

(2M)

c. The equation of Line 2 is $y-2=-\frac{4}{3}(x-6)$. Use an algebraic method of your choosing to determine the exact point at which the two functions intersection.

(4M)

d. If Line #1 is $y=f(x)$, determine $f(3)$.

(1M)

e. If Line #2 is $y=g(x)$, solve for x if $g(x)=6$.

(1M)

f. (AP/HL) Solve for x if $f(x)>g(x)$.

3. In this question, you will deal with the quadratic function, $Q(x) = -\frac{1}{4}(x-4)^2 + 3$.

(4 marks)

a. State the range of $Q(x)$. Give reason(s) for your stated range.

(2M)

b. State the range of $Q(x) = x^2 - 6x + k$. Show/explain the key steps of your solution. (AP/HL)

c. Evaluate $Q(-4)$.

(2M)

4. Mr. S. is solving the linear system defined by: Line #1: $9x - 27y - 32 = 0$ and Line #2: $3y - x = -4$. Shown below is the solution that he wrote on the board:

(4 marks)

From Line #2 $\Rightarrow$ $3y + 4 = x$

$\therefore 9(3y + 4) - 27y - 32 = 0$

$27y + 36 - 27y - 32 = 0$

$0 + 4 = 0$

$\therefore 4 = 0$

a. From his solution, EITHER

(2M)

i. explain what mistake he made and show in what step he made his mistake,

ii. explain what his solution means

iii. If you selected option (i) above, correct the mistake and find the correct solution to the linear system

iv. If you selected option (ii) above, prove that your explanation to the system is true.

(2M)