



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

IM 3 UNIT TEST V2 - Working with Functions

Teacher: Mr. Santowski and Ms. Aschenbrenner

Score: \_\_\_\_\_

**PART 1 - CALCULATOR ACTIVE QUESTIONS**

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.

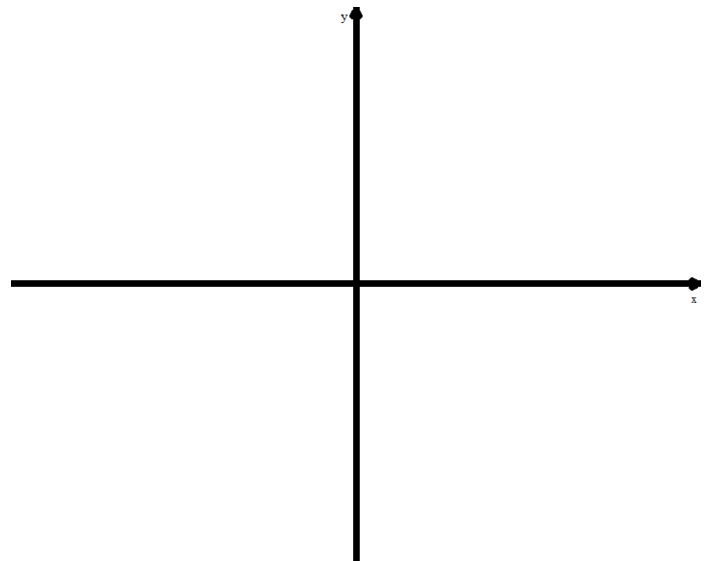
1. Given the function  $f(x) = 4 - \sqrt{5 - x}$ , determine the:

**(7 marks)**

a. the domain and range of  
 $f(x) = 4 - \sqrt{5 - x}$ .

b. the x-intercept(s) and y-intercept(s).

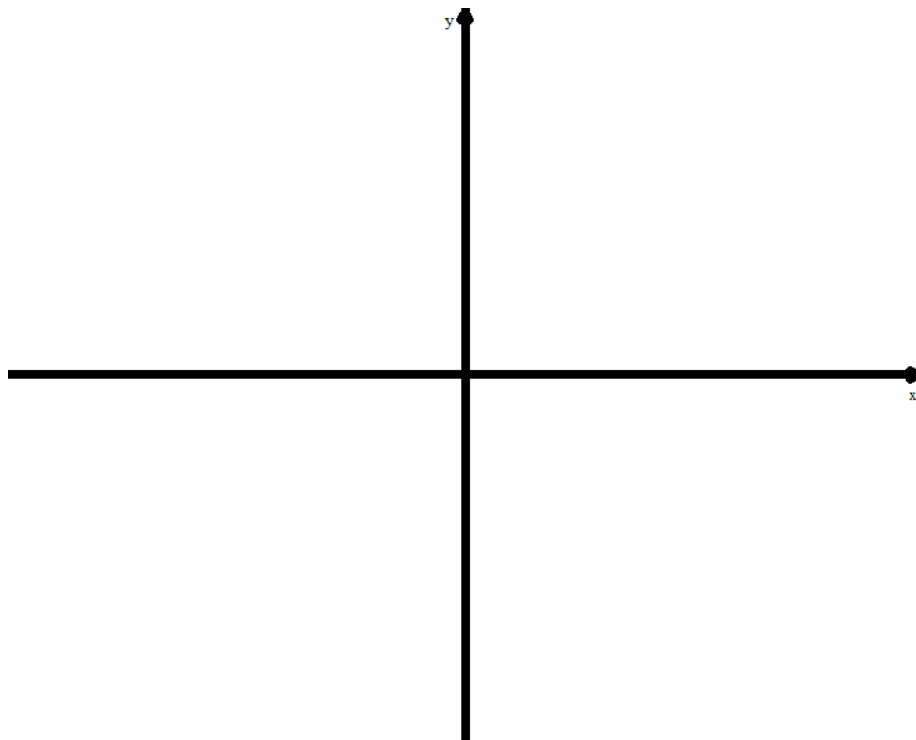
c. **sketch** the function and **label** 3 data points.

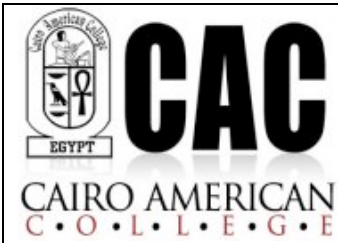


2. Given the function  $f(x) = (\sqrt{x+3})(x-5)^2$  and the X window settings of  $X_{\min} = -5$  and  $X_{\max} = 10$ , determine:

**(9 marks)**

- Appropriate Y window settings.
- The critical point(s).
- The interval(s) of increase and decrease.
- Sketch and label the keys points.





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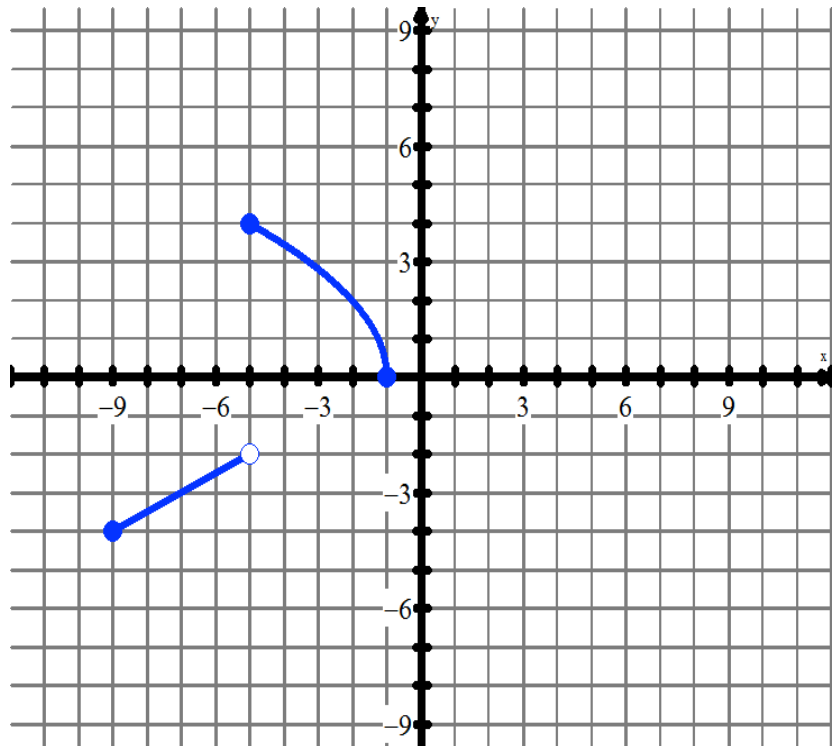
**PART 1 - CALCULATOR INACTIVE QUESTIONS**

*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 work.*

1. In this question, you will graph an inverse of a function.

**(6 marks)**

a. Explain how to draw the graph of an inverse of any function.



b. Graph the line  $y = x$  on the graph provided.

c. Given your answers to these previous 2 questions, graph the inverse of this function on the graph provided. Show supporting work (if necessary).

2. You are going to work with the linear function  $f(x) = -\frac{3}{4}x - 2$ . As you work through and answer the following questions, **ALWAYS** show your work OR explain your reasoning. **(12 marks)**
- a. Would the point (12,-11) be on the graph of this linear function? Show necessary work.
- b. What is the x-intercept of the **inverse** function?
- c. Determine the equation of the inverse of  $f(x) = -\frac{3}{4}x - 2$ .
- d. Malak **PREDICTS** the value of  $f^{-1}(-11)$  to be 12. Explain the reasoning/thinking for her prediction.
- e. Now, use your equation for  $f^{-1}(x)$  from Q2c to evaluate  $f^{-1}(-11)$ . Show your work.
- f. What do your answers from Q2d and Q2e mean about your work in Q2c?

3. Mr. Santowski is studying the relationship between the number of hours that students spend studying,  $h$ , and the marks they get on their December Semester exams,  $M$ . Included below is a sample data set from his study.

Hours Studied, $h$	2	5	3.5	1	8	3	9	12
Exam Mark (%), $M$	68	61	81	48	85	75	93	88

**(14 marks)**

- a. What does the domain of this relation represent?
- b. Does this relation HAVE to be a function? Why or why not?
- c. Evaluate  $M(3.5)$  and explain what it means in the context of this problem.
- d. Solve  $M(h) = 68$  and explain what it means in this context.
- e. After marking all student exams, Ms. A suggests that we apply a transformation to this relation and suggests an equation:  $y = M(h) + 5$ . Explain what this transformation would do to the graph of the relation and to the student marks.

Omar wonders about the **meaning** of the inverse of this relation.

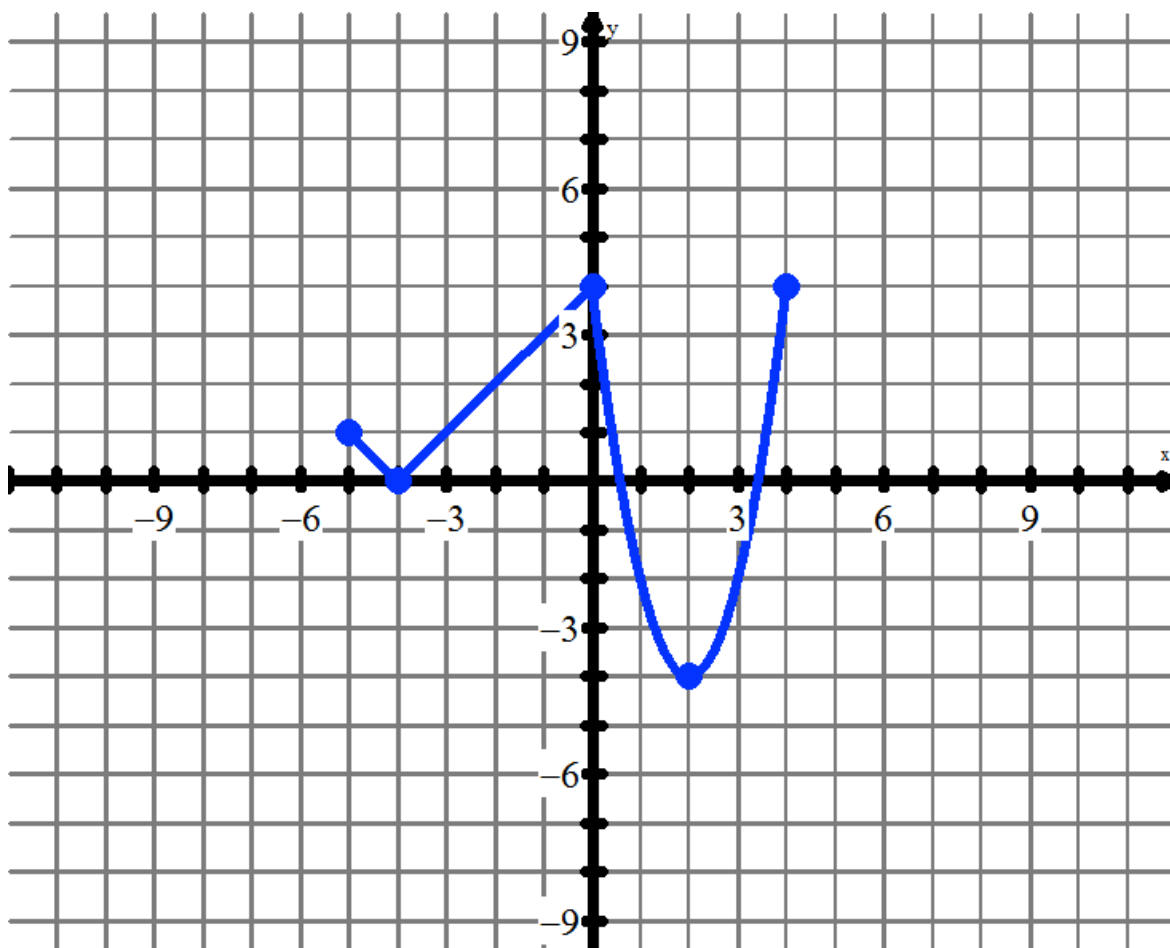
- f. What is the **meaning** of the **range** of this inverse relation?
- g. **ESTIMATE** a reasonable value of  $M^{-1}(70)$  and **EXPLAIN** what would the result mean?
- h. Given your answers to the previous 2 questions, how would students make use the equation for the inverse? (What is the point of this inverse relation? (HINT: Think about your answer for Q3(f) and Q3(g) )

4. You have been provided with a graph of a piecewise function,  $y = f(x)$ , which is pictured below.

**(8 marks)**

a. Given the NEW equation of  $y = \frac{1}{2}f(x+1) - 3$ , list what transformations will be applied to  $y = f(x)$

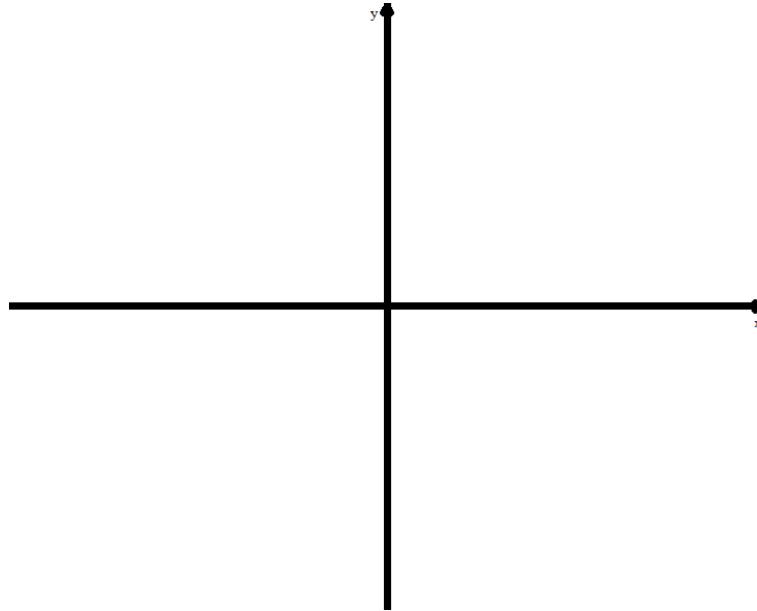
- b. Now apply the transformations to  $y = f(x)$  and sketch the new transformed function. Show all necessary work to support your sketch of the new function.



5. Characteristics of Functions: You will produce a sketch of a function that meets the following requirements:

**(12 marks)**

- The domain is to be  $\{x \in \mathbb{R} \mid x < 4\}$ .
- The function is to be increasing ONLY on the interval of  $\{x \in \mathbb{R} \mid -2 < x < 2\}$ .
- The absolute minimum point must be at  $(-2, -9)$ .
- The function must have an asymptote.



- Label your KEY POINTS.
- Explain why the range of your function is  $\{y \in \mathbb{R} \mid y \geq -9\}$ .
- EXPLAIN what you would have to do with your KEY POINTS in order to graph the new function  $y = f(x - 2) + 4$ .
- Is inverse of your function also a function? Explain why or why not.