

# Quiz 2

Show all your work

Name: \_\_\_\_\_  
Score: \_\_\_\_/36

**No Calculator allowed in this part.**

**Problem 1:** Given that a parabola opens upwards with a vertex at  $(3, -4)$ , does this uniquely determine the parabola? If yes, explain. If no, provide at least two different parabolas satisfying the given conditions.

Score: /2

**Problem 2:** Given that a parabola opens downwards with zeroes at  $x = 2$  and  $x = -5$ , does this uniquely determine the line of symmetry for the parabola? If yes, explain. If no, provide at least two different parabolas satisfying the given conditions.

Score: /2

**Problem 3:** Consider the following five functions:

$$f(x) = |x|, \quad g(x) = (x-2)^2 + 3, \quad h(x) = \frac{3}{x}, \quad k(x) = -x^3, \quad \ell(x) = x(x+3)(x-4)(x-10)$$

List all functions that are not one-to-one.

For each not one-to-one function, provide a restricted domain in interval notation to make it one-to-one. Graphing each of the five functions may help you make your decision.

Score: /6

**Problem 4:** Consider the following three functions: a parabola, a radical, and a rational function,

$$f(x) = x^2 - 5, \quad g(x) = \sqrt{3 - x}, \quad h(x) = \frac{2 + x}{x + 7}.$$

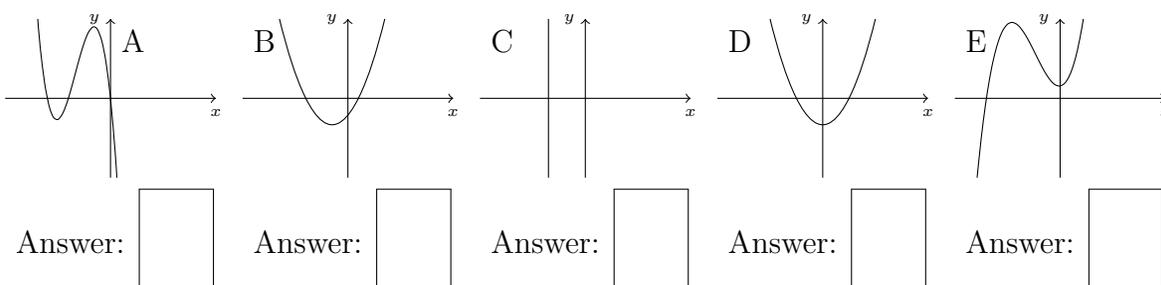
a. Which of the three given functions has the largest domain? Score: /1

b. Which has the largest range? Score: /1

c. Does  $g \circ h = h \circ g$ ? Score: /2

d. Find the domain of  $h \circ g$  in interval notation. Score: /2

**Problem 5:** Match each graph (A–E) with its equation (a–o).



a.  $y = x^2 + 3$

b.  $x = -7$

c.  $y = (x + 4)x(x - 4)$

d.  $y = (x - 3)(x - 11)(x - 15)$

e.  $y = (x + 5)(x - 5)$

f.  $y = (x + 14)(x^2 + 5)$

g.  $y = -(x + 14)(x + 4)$

h.  $y = (x - 4)(x - 14)$

i.  $y = (x + 11)(x + 7)(x + 3)$

j.  $y = (x + 8)(x - 3)$

k.  $y = -(x + 12)(x + 8)x$

l.  $y = -(x + 5)(x - 5)$

m.  $y = -x(x - 4)(x - 8)$

n.  $y = -x^2$

o.  $y = (x - 7)^2 + 3$

Score: /5

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**Problem 6:** Given that  $f(x) = \frac{2x+3}{4-5x}$ , find the inverse of  $f$  and give the domain and range of  $f$  and  $f^{-1}$ .

Score: /3

**Problem 7:** Find the quotient and remainder of the following polynomial division.

$$(x^4 - 4x^2 + 3x - 1) \div (x + 3)$$

Score: /2

**Problem 8:** Find the remainder on dividing  $h(t) = 3t^{15} - 4t^{10} + t^8 - 6$  by  $t + 1$ .

Score: /1

**Problem 9:** Capilano University Canning Company makes cans of blackberry preserve. They would like the height of the can to be twice the length of the diameter.

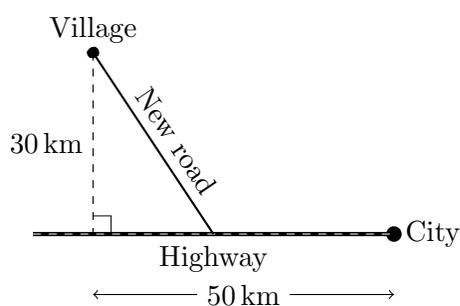
- a. Suppose that the volume needs to be at least  $500 \text{ cm}^3$ ; set up a function to solve for the dimension requirements.

Score: /2

- b. Suppose that the company has at most  $1000 \text{ cm}^2$  of canning material per can. What is the height and diameter of the largest possible can? Does the can satisfy the volume requirement above?

Score: /3

**Problem 10:** A civil engineer is to build a road joining a village to a highway that enables drivers to reach the city in the shortest time. How should this be done if the speed limit is  $60 \text{ km/h}$  on the road and  $110 \text{ km/h}$  on the highway? The perpendicular distance from the village to the highway is  $30 \text{ km}$ , and the city is  $50 \text{ km}$  down the highway. Give your answer to 2-decimal place accuracy.



Score: /4