Math 105
Summer 2013
Dr. Lily Yen

Quiz 2

Show all your work

Name: _____

Score: ___/34

No Calculator allowed in this part.

Problem 1: Given that a parabola has a line of symmetry at $x = -3$, and the range of the parabola is $(-\infty, 5]$. Find a general equation of such a parabola with an appropriately quantified unknown.

Score: /2

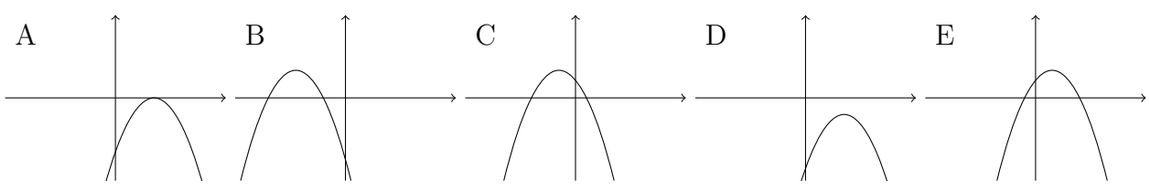
Problem 2: After solving a quadratic inequality, you arrive at the following solution:

$$x \in (-\infty, -5) \cup (3, \infty)$$

Find a general quadratic inequality with an appropriately quantified unknown.

Score: /2

Problem 3: The following graphs are parabolas. Match each (A–E) with the function (a–k) that equals to its graph.



Answer: Answer: Answer: Answer: Answer:

a. $y = -(x+2)(x-8)$

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

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

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

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

f. $y = -(x-7)^2$

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

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

i. $y = -x^2 - 3$

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

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

Score: /5

Problem 4: Consider the following five functions:

$$f(x) = x^2 + 8x - 7, \quad g(x) = \frac{1}{3}\sqrt{1-x}, \quad h(x) = 2 + (2-x)^2,$$
$$r(x) = \frac{5-3x}{7-4x}, \quad s(x) = 6|5-3x| + 7$$

a. Order the functions from the largest range to the smallest range.

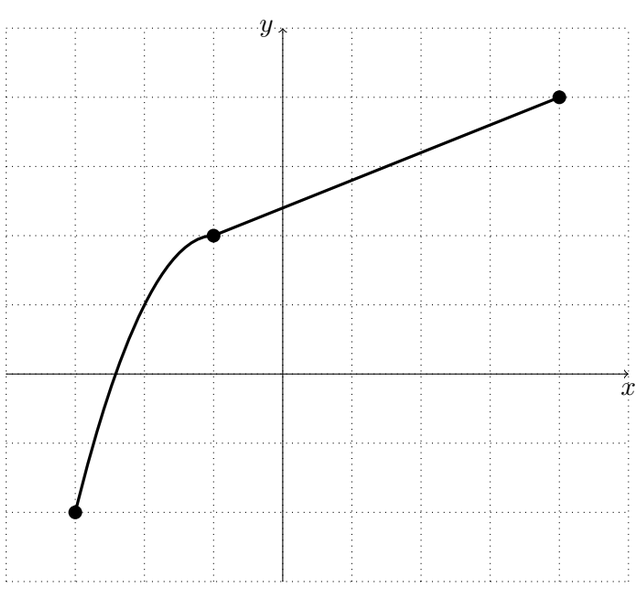
b. List all functions that are invertible?

c. Find $(g \circ r)(x)$.

d. Give the domain of $g \circ r$ in interval notation.

Score: /8

Problem 5: Given the graph of f below, does f^{-1} exists? If not, explain why not. If yes, draw f^{-1} on the same grid.



Score: /2

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Calculator allowed in this part.

Problem 6: The annual U. S. box office revenue in billions of dollars for a span of years beginning in 2002 can be modelled by the function

$$B(x) = -0.19x^2 + 1.2x + 7.6, \quad x \in [0, 7]$$

where x is years after 2002. In what year was box office revenue at its highest in that time span? Find the maximum revenue to 3 decimal places.

Score: /4

Problem 7: The price $\$p$ per hot dog at which q hot dogs can be sold during a baseball game is given approximately by

$$p = g(q) = \frac{9}{1 + 0.002q}, \quad q \in [1000, 4000].$$

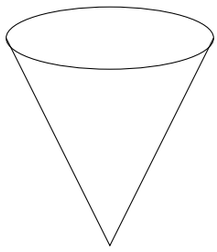
a. Find the range of g.

b. Find $q = g^{-1}(p)$ and its corresponding domain and range. Print your g, p, and q extremely clearly.

c. Express the revenue (dollars received from selling hot dogs) as a function of p. Simplify your function.

Score: /5

Problem 8: A conical paper cup with diameter 10 cm and height 10 cm is initially full of water. A small hole is made in the bottom of the cup and the water begins to flow out of the cup. Let h and r be the height and radius, respectively, of the water in the cup t minutes after the water begins to flow. Recall that the volume of a cone is $V = \frac{1}{3}\pi r^2 h$.



a. Express r as a function of h using properties of similar triangles.

b. Express the volume, V, of the water as a function of h only. Simplify your function to leave no parentheses.

c. If the height of the water after t minutes is given by $h(t) = 10 - \dfrac{\sqrt{t}}{2}$ (cm), express V as a function of t. You may leave a pair of parentheses.

d. How many minutes after the water begins to flow will the volume be half of what it began as? Provide a 3-decimal-place accuracy.

Score: /6