Math 196L **PROBLEM SET 5** **NAME:**

Instructions: Read each problem. Write a sentence or two about the approach you might take to solve each problem. Draw a picture to illustrate the scenario. Write a formula that might be needed to help set up or solve the problem.

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1. a) Suppose a closed box with a square base has a surface area of ***A***. Determine the volume of the box in terms of the length of a side of the square base. Note: *The constant **A** will be part of your equation.*

b) If the surface area is 1000, find the maximum volume of the box.

2. A grain silo on a barn is constructed from a hemisphere on top of a cylinder. If the volume of the silo needs to be 864π cubic meters, find the dimensions of the silo (height and radius of the cylinder) that give the minimum surface area.

3. A quadratic function $Q(x)$ passes through the points $(1,2)$ and $(-3,6)$.

   a) Write an equation for $Q(x)$ if $(1,2)$ is the vertex.

   b) Write an equation for $Q(x)$ if $(-3,6)$ is the vertex.

   c) Write an equation for $Q(x)$ if the graph is symmetric with respect to the y-axis.

   d) Write an equation for $Q(x)$ if $Q(x)$ has a zero at $x = 2$

4. Let $f(x) = \sqrt{x-4}$ and $g(x) = \sqrt{8-x}$. State the domain of each of the following:

   a) Domain of f: _____

   b) Domain of g : _____

   c) Domain of $f + g,\ f - g,\ fg$:_____

   d) Domain of $\frac{f}{g}$: _____

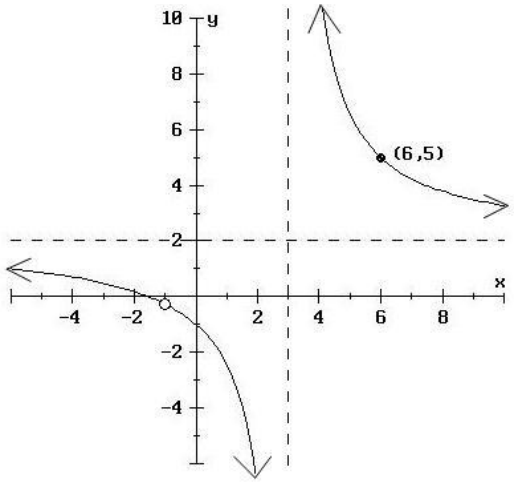
   e) Domain of $\frac{g}{f}$:_____

   f) Domain of $f \circ g$: _____

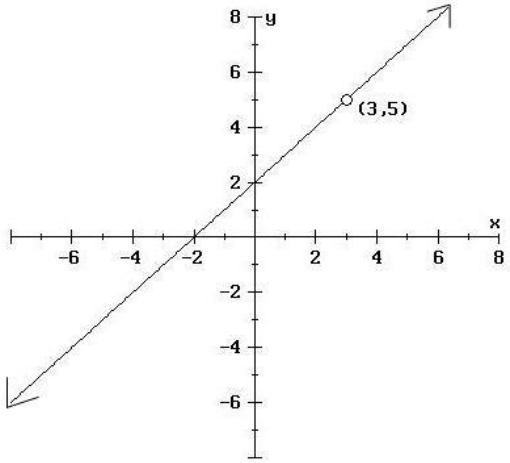
   g) Domain of $g \circ f$:_____

   h) Domain of $f \circ f$:_____

5. a) Determine a formula for the rational function graphed below. Note: There is a hole in the graph at the point (-1, 0).



b) Determine a formula for the rational function graphed below.



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6. Given the following statements about $f(x)$ are true:

$f(x)$ is a polynomial function.
$f(x) = 0$ at exactly four different values of x.
$f(x) \to -\infty$ as $x \to -\infty$ and $f(x) \to -\infty \; as \; x \to \infty$

For each of the following statements, if possible, write an equation for the function and draw its graph. If this is not possible, explain why it can't be done.

a) $f(x)$ is an odd function.

b) $f(x)$ is an even function.

c) $f(x)$ is a fourth degree polynomial.

d) $f(x)$ is a fifth degree polynomial.

e) $f(-x) \to -\infty$ as $x \to -\infty \; and \; f(-x) \to -\infty \; as \; x \to \infty$.

f) $f(x)$ is a one-to-one function.

g) The leading coefficient is -0.001.