SPRING 2017 Problem Set 6 Name: _____

This week the assignment will be in two parts with instructions as follows:

Part 1: 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.

Part 2: Read them and rank them in the order you would like to do. 1 being the highest priority (You don't know how to do) and 7 being the lowest (You know how to do the problem.). You do not need to attempt these problems prior to class. These problems will be attempted with your group during our class.

Part 1:

1. Assume a, b, c, d, e, and f are real constants for the following questions.

   (A) Can the graph of $f(x)=\dfrac{ax+b}{cx+d}$ cross its horizontal asymptote where $ax+b \neq cx+d$? If yes, then where?

   (B) Can the graph of $g(x)=\dfrac{ax^2+bx+c}{dx^2+ex+f}$ cross its horizontal asymptote where $ax^2+bx+c \neq dx^2+ex+f$? If yes, then where?

   (C) Can a rational function cross its vertical asymptote? Explain.

   (D) Can a rational function cross its horizontal asymptote? Explain.

2. Suppose that the risk of having an accident on a very dangerous road while driving a car can be modeled using the (logistic) equation

$$R = \frac{A}{1 + be^{-rx}}$$

where R is the percent risk of having an accident, and x is the blood alcohol concentration, BAC, (also a percent).

(A) If we believe that the chance of accident goes to 100% for very large values of the BAC x, and that the risk for a sober driver on this road is $\frac{100}{61}$%, which of the parameters in the model can you determine?

(B) Suppose the risk for a driver with BAC of 0.08% (half of the extreme DUI threshold) is approximated to be 8.83%. What is the predicted risk for a driver at the extreme DUI threshold?

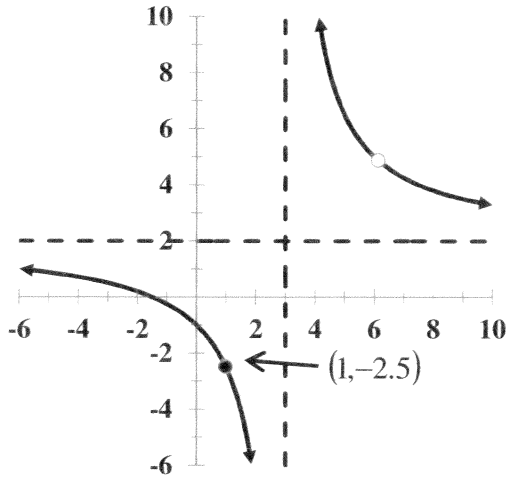
(C) What BAC would correspond to a 50% chance of an accident? Does that seem plausible?

Part 2:

3. If $x = -2$ is a zero of $f(x)$ and $f(x) = x^3 - 3x^2 - kx + 12$, find the two other zeros, algebraically. Write $f(x)$ in complete factor form.

4. Determine a formula for the rational functions graphed below.

(A) *Note:* There is a hole in the graph at $x = 6$.



(B) *Note:* There is a hole in the graph at $x = 3$

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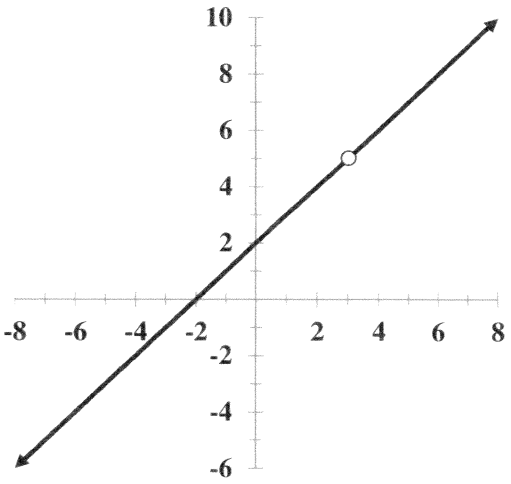

5. Let $g(x)$ be the rational function that has a slant asymptote $y = 2x + 1$, a vertical asymptote at $x = 3$ and one of its x-intercepts at $(4, 0)$. Determine a formula for $g(x)$ and use the formula to determine the other x-intercept and the y-intercept.

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

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

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

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

(D) Write an expression for $Q(x)$ if $Q(x)$ has a zero at $x = 2$

7. 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 $x \to \pm\infty$.

For each of the following statements decide if the statement is **Always true**, **Never true** or **Sometimes true.** For **Always true** and **Never true,** justify your answer. If **Sometimes true** give an example of when it could be true and when it might not be true.

(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 $x \to \pm\infty$.

(F) $f(x)$ is a 1-1 function.

(G) The lead coefficient is -0.001.

8. $g(t) = -2(t-a)^2(t-b)(t-c)$ where $a < b < 0 < c$. What is the vertical intercept? What are the horizontal intercepts? On what interval(s) is/are $g(t) > 0$?

9. Consider the function in graph given below. Find the coordinates of C in terms of b.