Prerequisite Test – Calculus 1 - Fall 2013 **NAME:** ______________________________

1. (2 pts) Factor completely.

$x^3 - 8x^2 - 9x =$

2. (4 pts) Simplify as much as possible (assume $x \neq \pm 1$).

$$\frac{4x}{x^2-1} - \frac{2}{x+1} =$$

3. (3 pts) Simplify. No negative or rational exponents in your final answer.

(a) $\left(\frac{4}{9}\right)^{-3/2} =$ (b) $2\sqrt{12} - 3\sqrt{27} =$ (c) $\frac{a^{-1}b^3}{a^{-2}b^4} =$

4. (4 pts) (a) (1 pt) Find the distance between the points $(-1, 2)$, $(2, -1)$.

(b) (3 pts) Find the equation of the line that contains the points $(-1, 2)$, $(2, -1)$.

5. (6 pts) Sketch the graph of each of the following functions and mark the coordinates of axis intercepts.

(a) $f(x) = 4 - x^2$ (b) $g(x) = 3x - 4$ (c) $h(x) = \begin{cases} 4 - x^2 & \text{if } x \leq 2 \\ 3x - 4 & \text{if } x > 2 \end{cases}$

6. (4 pts) True or False? Assume a, b are positive real numbers. Circle "True" if the equality holds for all a, b. Otherwise, circle "False".

$\sqrt{a^2 + b^2} = a + b$ True False

$\dfrac{1}{\frac{1}{a} + \frac{1}{b}} = a + b$ True False

$\ln(a + b) = \ln a + \ln b$ True False

$\sin^2 a + \cos^2 b = 1$ True False

7. (5 pts) Fill in the exact values:

$\sin(\pi/6) =$ $\cos(5\pi/4) =$ $\tan^{-1}(1) =$

$\ln(\sqrt{e}) =$ $\log_3(\dfrac{1}{9}) =$

8. (6 pts) Given $f(x) = \sqrt{4 - x^2}$ and $g(x) = x^2 + 2$, find:

(a) (2 pts) Find the domain of the function $f(x)$.

(b) (2 pts) Find a formula for the composition $(g \circ f)(x)$.

(c) (2 pts) Find a formula for the composition $(f \circ g)(x)$.

9. (12 pts) Find all real solutions of the following equations (3 pts each):

(a) $x^2 + x - 1 = 0$

(b) $9^x = 3^{x-1}$

(c) $7 \cdot (2^{3x}) = 5$ Leave your answer as a logarithm for this one.

(d) $\sin(2x) = \cos x$ OK to find all solutions $x \in [0, 2\pi]$ for this one.

10. (4 pts) Is there a rectangle whose area is equal to the square of its semi-perimeter? Justify your answer.