Math 130 **Exam 1** **10/17/2014**

Name: _____

Answer the questions on the exam and not on a separate sheet of paper. No work is necessary for the True/False questions. For all other questions, please circle your answers and show your work for full credit. There are 10 questions for a total of 100 points.

True or False: Please circle either true or false. No work is necessary.

1. (5 points) A function can assign one element from the domain to two or more elements in the range.

   A. True B. False

2. (5 points) If $f(x) = x + 1$ and $g(x) = 6x$, then $(f \circ g)(x) = (g \circ f)(x)$.

   A. True B. False

3. (5 points) It is possible for a sixth-degree polynomial to have exactly one solution.

   A. True B. False

4. (5 points) The rational function $f(x) = \dfrac{2x^3 - 5x + 3}{x^2 - 2}$ has a vertical asymptote of $x = 2$.

   A. True B. False

5. (5 points) If the limit of $f(x)$ as x approaches c is 0, then there must exist a number k such that $f(k) < 0.0001$.

   A. True B. False

Short Answer: Show your work for full credit.

6. Consider the function $y = x^2 + 2$.

   (a) (5 points) Find the slope of the secant line between $(1, 3)$ and $(2, 6)$;

   (b) (5 points) Find the function that represents the slope of the secant of $f(x)$ between $(1, 3)$ and an arbitrary point $(x, f(x))$;

   (c) (5 points) Use the limit to find the slope of the tangent line of $f(x)$ at $(1, 3)$.

7. (15 points) Assume that for all values of x we have that $4 - x^2 \leqslant f(x) \leqslant 4 + x^2$. Determine the limit of $f(x)$ as x approaches 0. Justify your answer.

8. (15 points) Let $f(x)$ and $g(x)$ be functions such that $\lim_{x \to c} f(x) = \pi$ and $\lim_{x \to c} g(x) = 5$. Determine the value of

$$\lim_{x \to c} \left[\frac{2f(x) + 3g(x)}{f(x)g(x)} \right].$$

Write your answer in terms of π and make sure to justify your answer.

9. (15 points) Let $f(x) = x^3 - 3x - 2$.
   (a) Verify that $x = 2$ is a zero of $f(x)$.
   (b) Use Part (a) to factor $f(x)$ completely.

10. (15 points) Describe the right-hand and left-hand behavior of the graph of

$$f(x) = -2014x^{2013} - x^{2012} + x^{2011} - 3.$$

Is it possible for this function to have no zeros?