MATH 1551 Sample Midterm Exam 1

Directions: This is a First Midterm Exam. Its purpose is to check your preparedness for the exam. After you have reviewed your text, notes, quizzes, worksheets and homework, try this problems in an equivalent setting to the exam.
Work on you own without reference to notes or text. In the exam, you will need to show all work to receive credit.
Answers should be as specific as possible and it should be evident how they were obtained. Work neatly.
During the exam, it will not be allowed: formula sheet, notes, book, calculator or any electronic device. Only allowed: pen/pencil.

Name: _____

Question	Points	Score
1	20	
2	10	
3	15	
4	20	
5	35	
Total:	100	

1. (20 points) Given the functions $f(x) = \sqrt{x^2 - 3}$ and $g(x) = 1/(x - 1)$, find the following:
   (a) What is the domain and range of $f(x)$?
   (b) What is the domain and range of $g(x)$?
   (c) Write the formula and domain for $f \circ g$
   (d) Write the formula for $(f \circ g)^{-1}$.

2. (10 points) Given that $\sin\theta = 2u$ and $\pi/2 < \theta < \pi$, find $\tan 2\theta$.

3. (15 points) The population of Sunnydale is $100,000$ and is decreasing at the rate of 5% each year. When will the population decrease by half? Use the exponential growth/decay model. Simplify your expression as far as you can without a calculator.

4. (20 points) Evaluate the limits below or give an explanation as to why the limit does not exist.

(a)
$$\lim_{x\to\infty} \frac{\cos\left(\frac{1}{x^2}\right)}{x^2}.$$

(b)
$$\lim_{x\to 2^-} (x+1)\frac{|x+2|}{x+2}.$$

(c)
$$\lim_{x\to-\infty} \frac{5x^5 - 2x^3 + 9x}{3 + x - 2|x|^5}.$$

(d)
$$\lim_{x\to\infty} \left(\frac{1+x^3}{x+2x^2}\right)^7.$$

5. (35 points) The function f is given by the equation:

$$f(x) = \begin{cases} \dfrac{x^2 - 6x + 9}{2x^2 - 5x - 3}, & x < 0, \\ \dfrac{4x^2 + 18}{x - 6}, & x > 0. \end{cases}$$

   (a) Find $\lim_{x \to 0} f(x)$ and, or explain why the limit does not exist.

   (b) On what interval(s) is the function continuous?

   (c) Label any discontinuity as removable, jump or infinity. If there is a removable discontinuity, how might you redefine the function to make it continuous at that value?

   (d) Find all asymptotes, and draw the graph of $f(x)$.