Midterm Examination #1
Math 273 Calculus 1
Thursday, March 4, 1999

Name________________________

The use of graphing calculators is permitted.

§1 Computation:

1) Find the equation of the line through the points (2,1) and (0,-3). Find the slope and the intercepts. Graph the line.

2) Evaluate the following limits. Check your results by including an appropriate graph.
   a) $\lim_{x\to 4} x^2$.
   b) $\lim_{x\to 0} e^x \cos(2x)$.

3) Evaluate the following limits. Check your results by including an appropriate graph.
   a) $\lim_{x\to 0} \frac{\sqrt{x+1}-1}{x}$.
   b) $\lim_{x\to -3} \frac{x^2+x-6}{x+3}$.

4) Find the vertical asymptotes, if any, of the following functions. Check your results by including an appropriate graph.
   a) $f(x) = \frac{x^2-2}{x^2-x-2}$.
   b) $f(x) = \frac{x}{\sin x}$.

§2 Comprehension:

5) What is a function? Explain the meaning of domain and range. Give an example of a function whose domain and range are (both) different than the entire set of real numbers.

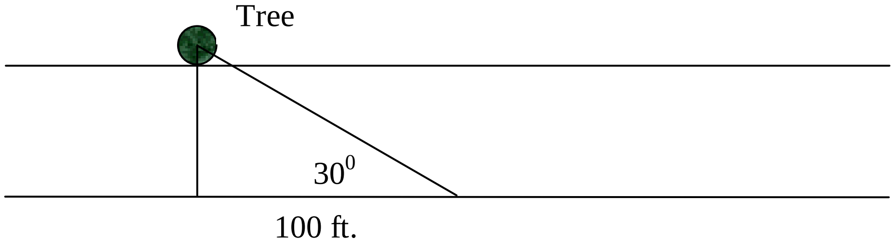
6) Give both an intuitive definition and a rigorous definition of a limit. Explain how to use the rigorous definition to prove that $\lim_{x\to 2}(3x-1) = 5$.

7) What does it mean for a function to be continuous? Is every polynomial continuous? If so, explain why; if not give an example of a discontinuous polynomial.

§3 Applications:

8) Write a linear relationship that expresses the relationship between the temperature in degrees Celsius C and Fahrenheit F. Use the fact that water freezes at 0 C or at 32^0 F, and that water boils at 100 C or at 212^0 F.

9) A surveyor wants to measure the width of a river. She finds a tree on one side of the river, and positions herself directly across the river from this tree. She then walks down the river 100 feet and looks back at the tree. If the angle between the riverbank and the tree is 30^0, how wide is the river?



10) A patrol car is parked 50 feet from a long warehouse with its revolving lights on. Find the position $x(\theta)$ of the light beam on the warehouse as a function of the angle θ. Find the limit $\lim_{\theta \to (\pi/2)^-} x(\theta)$. If the beam of light completes one revolution every ½ second, and the beam of light initially pointed directly at the wall, write down an equation that describes the position of the beam of light on the wall as a function of time $x(t)$. Find the limit $\lim_{t \to (1/2)^-} x(t)$.