Math 101-162-Class Test

Name: ID Serial:

Show all your work. No credits for answers not supported by work

1) If $f(x) = 4 - x^2, \quad where \quad -3 \leq x \leq 1$, find the absolute extreme values.

2) If $f(x) = x^2\sqrt{6-x}$,
   a) Find the intervals on which the function is increasing and decreasing.
   b) Find the values of the local extrema, and indicate if these values are minima or maxima.

3) Consider the function $f(x) = xe^{-x}$. Its first derivative is $f'(x) = (1 - x)e^{-x}$, and its second derivative is $f''(x) = (x - 2)e^{-x}$
   a. Determine the intervals on which f is increasing and the intervals on which f is decreasing
   b. Determine the intervals on which f is concave up and the intervals on which f is concave down.

4) A rectangle has its base on the *x-axis* and its upper two vertices on the parabola$y = 12 - x^2$, what is the largest area the rectangle can have, and what are its dimensions?

5) Find

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

b) $\lim_{x\to\infty}\frac{e^{x}+x^{2}}{e^{x}+x^{3}}$.