Math 101-151-Class Test III

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) Let $f(x) = \begin{cases} x^3 & -2 \leq x \leq 0 \\ x^2 & 0 < x \leq 2 \end{cases}$
   a) Does f satisfy the hypothesis of the Mean Value Theorem? Explain.
   b) If yes, find the value c that satisfies your conclusion.

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) Bonus: Find $\lim_{x\to\infty} \left(\frac{x+2}{x-1}\right)^x$ using a different method than the one used in a) above.

6) A rectangle has the following dimensions: 3 cm by 2 cm. The 2 cm side is expanding at the rate of 4 cm/sec and the proportions of the rectangle never change. How fast is the rea of the rectangle increasing when its dimensions are 12 cm by 8 cm?