Math 125-Quiz 25 ~~6~~

November 18, 2011
Dec. 2

You have 20 minutes to complete this quiz. It will count for 25 quiz points (as opposed to the usual 10) You may use a calculator for arithmetic only. Be careful about justifying your answers and showing your work.

1. (a) State the Mean Value Theorem, with careful attention to the hypotheses and notation.

If f is continuous on $[a,b]$ and differentiable on (a,b), then there exists c on (a,b) s.t.

$$f'(c) = \frac{f(b) - f(a)}{b - a}$$

(b) Consider the function $f(x) = x^2 + 2x$. Find the point that satisfies the MVT on the interval $[1,4]$

on $1,4$

$f'(x) = 2x + 2$

$f'(c) = 2c + 2 = \frac{f(4) - f(1)}{4 - 1} = \frac{24 - 3}{3} = 7$

$2c + 2 = 7$

$2c = 5$

$c = 2\frac{1}{2}$

2. How many inflection points should $f(x) = \dfrac{x^4}{6} - x^3 + 2x^2 + 5x + 1$ have? Find them.

Shd be 2 infl points as $f(x)$ is of degree 4.

$$f'(x) = \frac{2}{3}x^3 - 3x^2 + 4x + 5$$

$$f''(x) = 2x^2 - 6x + 4 = 0$$

$$= 2(x-1)(x-2) = 0$$

$$x = 1, 2.$$

points $\left(1, 7\frac{1}{6}\right)$

$\left(2, 13\frac{1}{3}\right)$

3. Find
$$\lim_{x \to 0} \frac{3x}{\tan(5x)}$$

$\sqrt[]{0}\%_0 \,''$

$$\lim_{x \to 0} \frac{3x}{\tan(5x)} \xrightarrow{L'H} \lim_{x \to 0} \frac{3}{5\sec^2 5x} = \boxed{\frac{3}{5}}$$