KEY

Math 125-Quiz 9[1]
September 23, 2011

You have ten minutes to complete this quiz.

1. Suppose that $f(x)$ satisfies $-3x^2 + 6x + 3 \leq f(x) \leq x^2 - 2x + 7$. Find

$$\lim_{x \to 1} f(x).$$

Since $\lim_{x \to 1} -3x^2 + 6x + 3 = -3 + 6 + 3 = 6$

and $\lim_{x \to 1} x^2 - 2x + 7 = 1 - 2 + 7 = 6$

By the squeeze theorem

$\lim_{x \to 1} f(x) = 6$

2. Let

$$g(x) = \begin{cases} (x+1) & \text{if } x \leq 0 \\ (1-x^2) & \text{if } 0 < x < 2 \\ x^2 - 2x + 2 & \text{if } 2 \leq x \end{cases}$$

Discontinuous @ x=2

Find the values of x for which $g(x)$ is discontinuous by taking appropriate limits.

$\lim_{x \to 0^-} g(x) = 0 + 1 = 1$ $g(0) = 1$

$\lim_{x \to 0^+} g(x) = 1 - 0^2 = 1$ g is cts @ x=1

$\lim_{x \to 2^-} g(x) = 1 - 2^2 = -3$ not

$\lim_{x \to 2^+} g(x) = 2^2 - 2 \cdot 2 + 2 = 2$ equal

so g is not cts. @ x=2

3. Why is

$$f(x) = \frac{x^2 - x}{x - 1}$$

discontinuous at $x = 1$? What sort of discontinuity does f have at $x = 1$?

$f(x)$ is not defined @ $x = 1$, so $\lim_{x \to 1} f(x) \neq f(1)$

Since $\frac{x^2 - x}{x - 1} = \frac{x(x-1)}{(x-1)} = x$, f has a removable discontinuity @ $x = 1$