Name: Solutions

Math 105: Fall 2013
Quiz 7: November 22

Correct answers accompanied by incorrect or incomplete work will not receive full credit. Good Luck!

(4) 1. Evaluate the following limits. Be sure to show all work. If you use L'Hopital's Rule show that you can use it.

(a) $\lim_{t\to\infty} \frac{2t+3}{5-4t} \cdot \frac{1/t}{1/t} = \lim_{t\to\infty} \frac{2+3/t}{5/t-4} = \frac{2+0}{0-4} = \boxed{-1/2}$

Note: You can also use L'Hopital's Rule on this problem.

$\frac{\lim_{t\to\infty} 2t+3}{\lim_{t\to\infty} 5-4t} = \frac{\infty}{-\infty}$ which is an indeterminant form

$\lim_{t\to\infty} \frac{2t+3}{5-4t} \overset{\text{via L'H Rule}}{=} \lim_{t\to\infty} \frac{2}{-4} = \boxed{-\frac{1}{2}}$

(4) (b) $\lim_{x\to 0} \frac{1-\cos(x)}{\sin(2x)}$

$\frac{\lim_{x\to 0}(1-\cos x)}{\lim_{x\to 0} \sin(2x)} = \frac{0}{0}$ which is an indeterminant form.

$\lim_{x\to 0} \frac{1-\cos x}{\sin(2x)} \overset{\text{via L'H Rule}}{=} \lim_{x\to 0} \frac{\sin x}{2\cos(2x)} = \frac{0}{2} = 0$

OVER

(4) 2. <u>FACT:</u> The equation $e^x - 10x = 0$ is impossible to solve algebraically.

Use the Intermediate Value Theorem (IVT) on $f(x) = e^x - 10x$ to show that $e^x - 10x = 0$ has a solution in $[0, 1]$.

hypotheses

$f(x)$ is continuous on the closed interval $[0, 1]$.

$f(0) = e^0 - 0 = 1$

$f(1) = e^1 - 10 \approx -7.28$

Note: 0 is between $f(0)$ and $f(1)$

Thus the IVT implies that there is "c" between 0 and 1 such that $f(c) = 0$, i.e. c is the solution to $e^x - 10x = 0$.