Name: ______________________ Math 211 Quiz 2

Section: 322 ☐ 323 ☐ Sep 20, 2012

1. (5 pts) Use natural logarithms to solve the equation and simplify your answer.

$$e^{5-x} = \frac{e^2}{10^3}$$

$$\ln\left(e^{5-x}\right) = \ln\left(\frac{e^2}{10^3}\right)$$

$$5 - x = \ln(e^2) - 3\ln(10)$$

$$= 2\ln e - 3\ln 2\cdot 5$$

$$= 2 - 3\ln 2 - 3\ln 5$$

$$\Rightarrow x = 5 - (2 - 3\ln 2 - 3\ln 5)$$

$$= 3 + 3\ln 2 + 3\ln 5$$

$$= 3(1 + \ln 2 + \ln 5)$$

2. (10 pts) Evaluate the following limits.

a. $\lim_{x\to 1}(2x^2-3)(x+1)^3$ b. $\lim_{x\to 1}\frac{\sqrt{x}-1}{x-1}$

a. Since $(2x^2-3)(x+1)^3$ is a polynomial, we can plug in $x=1$. Hence

$$\lim_{x\to 1}(2x^2-3)(x+1)^3 = (2-3)(1+1)^3 = -8$$

b.

$$\lim_{x\to 1}\frac{\sqrt{x}-1}{x-1} = \lim_{x\to 1}\frac{\sqrt{x}-1}{x-1}\,\frac{\sqrt{x}+1}{\sqrt{x}+1}$$

$$= \lim_{x\to 1}\frac{x-1}{(x-1)(\sqrt{x}+1)}$$

$$= \lim_{x\to 1}\frac{1}{\sqrt{x}+1}$$

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

3. (5 pts) The position, in meters, of an object is given by the equation $f(t) = 1 - t^2$, where t is measured in seconds. Find the velocity and the speed of the object after 2 seconds.

$$\lim_{h \to 0} \frac{f(t+h) - f(t)}{h} = \lim_{h \to 0} \frac{[1-(t+h)^2] - [1-t^2]}{h}$$

$$= \lim_{h \to 0} \frac{[\cancel{1} - \cancel{t^2} - 2th - h^2] - [\cancel{1} - \cancel{t^2}]}{h}$$

$$= \lim_{h \to 0} \frac{-2th - h^2}{h}$$

$$= \lim_{h \to 0} \frac{-2t - h}{1}$$

$$= -2t.$$

$$\Rightarrow f'(t) = -2t$$

at $t = 2$, $f'(2) = -4$ meters/sec (velocity)

$|f'(2)| = 4$ meters/sec (Speed).