MATH 155B, Quiz 1
August 30, 2012
Name: KEY

You have 15 minutes to complete this quiz. The use of calculators is not permitted.
**Show all work if you want full credit for your solutions. Zero credit will
be given for answers with zero work shown, even if the answer is correct.**
Good luck!

(1) Find a formula for the inverse of the function $f(x) = 3 + \sqrt{8 - x}$.

$$x = 3 + \sqrt{8-y}$$
$$x - 3 = \sqrt{8-y}$$
$$(x-3)^2 = 8 - y$$

$$y = 8 - (x-3)^2$$
$$\boxed{f^{-1}(x) = 8 - (x-3)^2, \quad x \geq 3}$$

(2) Evaluate $\lim\limits_{x \to \infty} (e^{-x} \sin x)$.

$$-1 \leq \sin x \leq 1$$
$$-e^{-x} \leq e^{-x} \sin x \leq e^{-x}$$

Since $\lim\limits_{x \to \infty} -e^{-x} = \lim\limits_{x \to \infty} e^{-x} = 0$,

by the Squeeze Theorem,

$$\boxed{\lim\limits_{x \to \infty} e^{-x} \sin x = 0.}$$

(3) Evaluate $\displaystyle\int_0^{\frac{\pi}{2}} \frac{\sin 2x}{1 + 3 \cos^2 x} \, dx$.

Let $u = 1 + 3\cos^2 x$.
Then, $du = -6 \cos x \sin x \, dx$
$$= -3 \sin 2x \, dx$$

$$= \frac{-1}{3} \int_4^1 \frac{du}{u}$$

$$= \frac{-1}{3} \ln |u| \Big|_4^1$$

$$\boxed{= \frac{1}{3} \ln (4)}$$

I have neither given nor received aid on this _____

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