MAT 221 – 051
Spring 2008
Test One

Show all work.
On the integration problems, show the details of each step.

Some stuff:

$$\sin^2 x = \frac{1-\cos 2x}{2}$$

$$\cos^2 x = \frac{1+\cos 2x}{2}$$

$$\sin 2x = 2\sin x \cos x$$

$$\cos 2x = \cos^2 x - \sin^2 x$$

reference angle	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$
	0°	30°	45°	60°	90°	180°	270°
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	0	–1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	–1	0
tan	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	–	0	–

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1. Integrate $\int x \sin 2x \, dx$. Show the details of each step.

2. Set up a definite integral to find the arc length of the curve $x = e^t - t$, $y = 4e^{t/2}$, $-8 \le t \le 3$. You need not do the integration.

3. Set up an integral that represents the area of the surface generated by revolving the portion of the curve $y = x + \sqrt{x}$, $1 \le x \le 2$ about the *x*-axis. You need not do the integration.

4. An equation of the tangent line to the curve

$$x(t) = e^{\sqrt{t}}$$
$$y(t) = t - \ln t^2$$

when $t = 1$.

5a. Find the points on the curve

$$x = 2t^3 + 3t^2 - 12t$$
$$y = 2t^3 + 3t^2 + 1$$

where the tangent line is horizontal.

5b. Find the points on the curve where the tangent line is vertical.

6. Set up a definite integral (or integrals) to determine the area that common to $r = 3 + 2\sin\theta$ and $r = 2$. You need not do the integration.