MAT 221 – 051
Spring 2008
Review for 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 $\int x^{-9} \ln x \, dx$.

2. Integrate $\int \cos^3(\pi x) \sin^4(\pi x) \, dx$.

3. Set up a definite integral to find the arc length of the curve $y = e^{-x^2}$ from $x = 0$ to $x = 3$. You need not do the integration.

4. Set up an integral that represents the area of the surface generated by revolving the portion of the curve $y = \left(4 - x^{2/3}\right)^{3/2}$, $0 \le x \le 8$ about the x-axis. You need not do the integration.

5.

$$x(t) = \sin 2t$$
$$y(t) = \cos 3t$$

Find $\frac{dy}{dx}$ at the point where $t = \frac{\pi}{6}$.

6. A particle travels along the curve

$$x(t) = 2t$$
$$y(t) = 1 + t^{3/2}$$

where t is time in minutes and x and y are distance in feet. Set up a definite integral to determine the distance traveled by the particle during the first 4 minutes. You need not do the integration.

7. Set up an integral that represents the total length of the inner loop of $r = -1 + 2\cos\theta$. You need not do the integration.

8. Set up a definite integral to determine the area that is inside $r = 2\sin\theta$ and outside $r = 1$. You need not do the integration.

9. Find points on the curve $r = \sin\theta$ where the slope of the tangent line is 1.

Recall that

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

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

$$\frac{\sin 2\theta}{\cos 2\theta} = \tan 2\theta$$