MA 112 - Calculus II
Worksheet #1
Professor Broughton

Name:_____ Box #:_____

1. For each $f(x)$ below find an anti-derivative $F(x)$.

$f(x)$	$F(x)$
$x^4 - x^2$	$\frac{1}{5}x^5 - \frac{1}{3}x^3 + C$
$2x^3 - 3x^2$	$\frac{1}{2}x^4 - x^3 + C$
$\sqrt{x}$	$\frac{2}{3}x^{3/2} + C$
$\cos(x)$	$\sin(x) + C$
$\sin(2x)$	$\frac{-1}{2}\cos(2x) + C$
$\sin(ax)$	$\frac{-1}{a}\cos(ax) + C$
e^x	$e^x + C$
$e^x + e^{-x}$	$e^x - e^{-x} + C$

2. Find the following, including the constant of integration. Show the steps.

$$\int 2x^2 - x^3 dx = 2\int x^2 dx - \int x^3 dx = 2\frac{x^3}{3} - \frac{x^4}{4} + C$$

$$\int 2\sqrt{x} - \frac{2}{\sqrt{x}} dx = 2\int x^{1/2} dx - 2\int x^{-1/2} dx = \frac{4}{3}x^{3/2} dx + 4x^{1/2} + C$$

$$\int 4\cos(t) - 3\sin(2t) dt = 4\int \cos(t) dt - 3\int \sin(2t) dt = 4\sin(t) + \frac{3}{2}\cos(2t) + C$$

$$\int \frac{e^{2x} - e^{-2x}}{5} dx = \frac{1}{5}\int e^{2x} dx - \frac{1}{5}\int e^{-2x} dx = \frac{1}{10}e^{2x} + \frac{1}{10}e^{-2x} + C$$

3. A electron of mass m, with no initial displacement or velocity is moving under a forcing function of the form

$$F(t) = 2500m\sin(100t).$$

Find the velocity and position at t = 10.

$$a(t) = F(T)/m = 2500m\sin(100t)/m = 2500\sin(100t)$$

$$
\begin{aligned}
v(t) &= \int a(t)dt = \int 2500\sin(100t)dt = -25\cos 100t + C \\
0 &= -25\cos 0 + C, C = 25, \\
v(t) &= 25 - 25\cos 100t
\end{aligned}
$$

$$
\begin{aligned}
s(t) &= \int v(t)dt = \int (25 - 25\cos 100t)\, dt = 25t - \frac{1}{4}\sin 100t + C \\
0 &= 25 \cdot 0 - \frac{1}{4}\sin(100 \cdot 0) + C, C = 0, \\
s(t) &= 25t - \frac{1}{4}\sin 100t
\end{aligned}
$$

$$
\begin{aligned}
v(0) &= 25 - 25\cos(1000) = 10.941 \\
s(0) &= 25 \cdot 10 - \frac{1}{4}\sin(1000) = 249.79
\end{aligned}
$$