UNIT TEST **Lessons 22–30** (100 points possible)

I. Integrate. (8 points per section)

1. $\int 2x\left(3-x^2\right)^6 dx =$

2. $\int \frac{2\cos(3\theta)}{\left(\sin(3\theta)\right)^4} d\theta =$

3. $\int \left(\sec^2(2\theta)+1\right) d\theta =$

4. $\int_1^3 \left(2x^2-3\right) dx =$

5. $\int_1^{e^2} \frac{dx}{x} =$

II. Find y as a function of x, given y = 5 when x = 0 and $\frac{dy}{dx} = x + \sin(x)$. (8 points)

III. Find the area bounded by y = cos(x), y = sin(x), x = 0, and x = $\pi/2$. (10 points)

IV. Given the following table of formulas, evaluate problems 1–3. (8 points per section)

$$\int \sin^n(u)\,du = -\frac{\sin^{n-1}(u)\cos(u)}{n} + \frac{n-1}{n}\int \sin^{n-2}(u)\,du + C$$

$$\frac{d}{dx}\left(\sin^{-1}(u)\right) = \frac{1}{\sqrt{1-u^2}}\frac{du}{dx}$$

$$\frac{d}{dx}\left(\tan^{-1}(u)\right) = \frac{1}{1+u^2}\frac{du}{dx}$$

$$\int \frac{du}{u^2\left(u^2 \pm a^2\right)^{\frac{1}{2}}} = \frac{-\sqrt{u^2 \pm a^2}}{\pm a^2 u} + C$$

1. $\displaystyle\int_0^1 \frac{2dx}{1+x^2} =$

2. $\displaystyle\int \sin^3(x+1)\,dx =$

3. $\displaystyle\int \frac{dx}{x^2\sqrt{x^2-25}} =$

V. At the beginning of an experiment, there were 100 bacteria. If they follow an exponential growth pattern with a rate of k = .02, how many bacteria will be present after three hours? How long will it take for the population to triple? (8 points)

VI. Find the area between the graph of $y = x^2 - x - 2$ and the x-axis from x = 0 to x = 3. (10 points)