

PRINT Your Name: \_\_\_\_\_

There are 11 problems on 6 pages. Problem 1 is worth 10 points. Each of the other problems is worth 9 points. SHOW your work. **CIRCLE** your answer. **NO CALCULATORS! CHECK** your answer whenever possible. If you want to pick up your exam before Monday, write a short note to that effect on the top of this page and I will leave your exam outside my office door, before I go home tonight.

1. Find  $\int \sin^3 x dx$ . Check your answer.

$$\int \sin^3 x dx = \int (1 - \cos^2 x) \sin x dx \xrightarrow{\substack{u = \cos x \\ du = -\sin x dx}} - \int (1 - u^2) du = -\left(u - \frac{u^3}{3}\right) + C$$

$$\left(\cos x - \frac{\cos^3 x}{3}\right) + C = \text{CIRCLED } -\cos x + \frac{\cos^3 x}{3} + C$$

$$\checkmark: \frac{d}{dx} \left( -\cos x + \frac{\cos^3 x}{3} \right) = \sin x - \sin x \cos^2 x = \sin x (1 - \cos^2 x) \checkmark$$

$$2. \text{ Find } \int \cos^4 x dx = \int \left(\frac{1}{2}(1 + \cos 2x)\right)^2 dx = \frac{1}{4} \int (1 + 2\cos 2x + \frac{1}{2}(1 + \cos 4x)) dx$$

$$= \text{CIRCLED } \frac{1}{4} \left( \frac{3}{2}x + \sin 2x + \frac{\sin 4x}{8} \right) + C$$