PRINT Your Name: _________________________________

There are 11 problems on 5 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.

1. Find \( \int \cos^5 x \, dx \). CHECK your answer.

\[
\int (1 - \sin^2 x)^2 \cos x \, dx = \int (1 - u^2)^2 \, du = \int (1 - 2u^2 + u^4) \, du
\]

\[u = \sin x, \quad du = \cos x \, dx\]

\[
= u - \frac{2u^3}{3} + \frac{u^5}{5} + C = \sin x - \frac{2\sin^3 x}{3} + \frac{\sin^5 x}{5} + C
\]

\[
\frac{d}{dx}(\text{Area}) = \cos x - 2\sin^2 x \cos x + \sin^4 x \cos x
\]

\[= \cos x \left( 1 - 2\sin^2 x + \sin^4 x \right)\]

\[= \cos^5 x (1 - \sin^2 x)^2 \checkmark\]

2. Find \( \int \cos^4 x \, dx = \frac{1}{4} \int (1 + \cos 2x)^2 \, dx = \frac{1}{4} \int (1 + 2\cos 2x + \cos^2 2x) \, dx \)

\[= \frac{1}{4} \int 1 + 2\cos 2x + \frac{1}{2} (1 + \cos 4x) \, dx = \frac{1}{4} \left( \frac{3}{2} x + \sin 2x + \frac{\sin 4x}{8} \right) + C\]