

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

**Quiz – September 21, 2004**

Find  $\int \sin^5 4x \cos^2 4x dx$ . **CHECK YOUR ANSWER.**

**Answer:** Save  $\sin 4x dx$ . Convert  $\sin^4 4x$  into cosines. The integral is equal to

$$\int (1 - \cos^2 4x)^2 \cos^2 4x \sin 4x dx.$$

Let  $u = \cos 4x$ ; so  $du = -4 \sin 4x dx$  and the integral is

$$-\frac{1}{4} \int (1 - u^2)^2 u^2 du = -\frac{1}{4} \int (u^2 - 2u^4 + u^6) du = -\frac{1}{4} \left( \frac{u^3}{3} - \frac{2u^5}{5} + \frac{u^7}{7} \right) + C$$

$$= \boxed{-\frac{1}{4} \left( \frac{\cos^3 4x}{3} - \frac{2 \cos^5 4x}{5} + \frac{\cos^7 4x}{7} \right) + C.}$$

**Check.** The derivative of the proposed answer is

$$\begin{aligned} & -\frac{1}{4} (-\sin 4x) 4 \left( \frac{3 \cos^2 4x}{3} - \frac{5 \cdot 2 \cos^4 4x}{5} + \frac{7 \cos^6 4x}{7} \right) \\ &= \sin 4x \cos^2 4x (1 - 2 \cos^2 4x + \cos^4 4x) = \sin 4x \cos^2 4x (1 - \cos^2 4x)^2 \\ &= \sin 4x \cos^2 4x (\sin^2 4x)^2 = \sin^5 4x \cos^2 4x \checkmark \end{aligned}$$