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

$$-\frac{1}{4}(-\sin 4x)4\left(\frac{3\cos^2 4x}{3} - \frac{5\cdot 2\cos^4 4x}{5} + \frac{7\cos^6 4x}{7}\right)$$

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

$$= \sin 4x \cos^2 4x \left(\sin^2 4x\right)^2 = \sin^5 4x \cos^2 4x \checkmark$$