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**Quiz 4 — September 1, 2015**

**Remove everything from your desk except this page and a pencil or pen.**

The solution will be posted soon after the quiz is given.

**Circle** your answer. **Show your work.** Your work must be correct and coherent. **Check your answer.**

Find  $\int \sin^3 x \cos^2 x dx$ .

**Answer:** Save one  $\sin x$ . Convert the rest of the  $\sin x$ 's into  $\cos x$ 's using

$$\sin^2 x + \cos^2 x = 1.$$

$$\int \sin^3 x \cos^2 x dx = \int \sin x (1 - \cos^2 x) \cos^2 x dx.$$

Let  $u = \cos x$ . It follows that  $du = -\sin x dx$ . The integral is equal to

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

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

$$\begin{aligned} -(\cos^2 x(-\sin x) - \cos^4 x(-\sin x)) &= -(-\sin x \cos^2 x)(1 - \cos^2 x) \\ &= \sin x \cos^2 x (\sin^2 x) = \sin^3 x \cos^2 x \checkmark. \end{aligned}$$