

PRINT Your Name: _____

Quiz 3 — August 27, 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 $\int e^{5x} \sin x dx$. **Check your answer.**

Use integration by parts. Let $u = e^{5x}$ and $dv = \sin x dx$. Compute $du = 5e^{5x} dx$ and $v = -\cos x$. We have

$$\int e^{5x} \sin x dx = -e^{5x} \cos x + 5 \int e^{5x} \cos x dx.$$

Use integration by parts again. Let $u = e^{5x}$ and $dv = \cos x dx$. Compute $du = 5e^{5x} dx$ and $v = \sin x$. We have

$$\int e^{5x} \sin x dx = -e^{5x} \cos x + 5 \left[e^{5x} \sin x - 5 \int e^{5x} \sin x dx \right].$$

Add $25 \int e^{5x} \sin x dx$ to both sides to see that

$$26 \int e^{5x} \sin x dx = -e^{5x} \cos x + 5e^{5x} \sin x + C.$$

Divide both sides by 26 to conclude that

$$\boxed{\int e^{5x} \sin x dx = \frac{1}{26} [-e^{5x} \cos x + 5e^{5x} \sin x] + K,}$$

where K is the constant $\frac{C}{26}$.

CHECK: The derivative of the proposed answer is

$$\frac{1}{26} \left[\begin{array}{l} e^{5x} \sin x - 5e^{5x} \cos x \\ + 25e^{5x} \sin x + 5e^{5x} \cos x \end{array} \right] = e^{5x} \sin x \checkmark.$$