

$$12. \int \sin(\underbrace{-3x}_u) \cos(\underbrace{5x}_v) dx$$

RECALL

$$\sin u \cos v = \frac{1}{2} [\sin(u+v) + \sin(u-v)]$$

$$= \int \frac{1}{2} [\sin(-3x+5x) + \sin(-3x-5x)] dx$$

$$= \frac{1}{2} \int (\sin 2x + \sin(-8x)) dx$$

$$= \frac{1}{2} \int \sin 2x - \sin 8x dx$$

$$= \frac{1}{2} \int \sin u dx - \frac{1}{2} \int \sin w dx$$

$u=2x \quad w=8x$
 $du=2dx \quad dw=8dx$

$$= \frac{1}{2} \cdot \frac{1}{2} \int \sin u du - \frac{1}{2} \cdot \frac{1}{8} \int \sin w dw$$

$$= \frac{1}{4} (-\cos u) - \frac{1}{16} (-\cos w) + C$$

$$= \left(-\frac{1}{4} \cos 2x + \frac{1}{16} \cos 8x + C \right)$$