

Ken Mei Group 6 Week #3 12/15/22

Standard 2: Integration by parts

1. $\int x e^{5x} dx$ Int by Parts $u \cdot v - \int v \cdot du$

$$u = x \quad du = dx$$

$$dv = e^{5x} dx \quad v = \frac{e^{5x}}{5} \quad x \cdot \frac{e^{5x}}{5} - \int \frac{e^{5x}}{5} dx$$

$$= \frac{x e^{5x}}{5} - \frac{1}{5} \int e^{5x} dx \quad \begin{array}{l} \text{V-Sub!} \\ u = 5x, \frac{1}{5} du = dx \end{array}$$

$$= \frac{x e^{5x}}{5} - \frac{1}{5} \cdot \frac{1}{5} \int e^u du \quad \int e^u du = e^u + C$$

$$= \boxed{\frac{x e^{5x}}{5} - \frac{1}{25} e^{5x} + C}$$

2. $\int (9x+12)e^x dx$ $\int u dv = u \cdot v - \int v du$

$$u = 9x+12 \quad du = 9 dx$$

$$v = e^x \quad dv = e^x dx$$

$$= (9x+12) \cdot e^x - \int e^x \cdot 9 dx$$

$$= (9x+12) \cdot e^x - \int 9e^x dx$$

$$= 9e^x x + 12e^x - 9 \cdot \int e^x dx = 9e^x x + 12e^x - 9e^x + C$$

$$= \boxed{9e^x x + 3e^x + C}$$

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Standard Z: Integration by Parts

$$3. \int (t+7)e^{2t+3} dt \quad \int u dv = uv - \int v du$$

$$u = t+7 \quad du = dt \\ v = \frac{1}{2}e^{2t+3} \quad dv = e^{2t+3} dt$$

$$\int e^{2t+3} dt \quad u = 2t+3 \quad \frac{du}{2} = dt \quad \int e^u du = e^u + C$$

$$\frac{1}{2} \int e^u du = \frac{1}{2} \cdot e^u + C = \frac{1}{2} e^{2t+3} + C$$

$$uv - \int v du = (t+7) \cdot \frac{1}{2} e^{2t+3} - \int \frac{1}{2} e^{2t+3} dt$$

$$= (t+7) \cdot \frac{1}{2} e^{2t+3} - \frac{1}{2} \cdot \int e^{2t+3} dt$$

$$= (t+7) \cdot \frac{1}{2} e^{2t+3} - \frac{1}{2} \cdot \frac{1}{2} e^{2t+3} + C$$

$$= \boxed{(t+7) \cdot \frac{1}{2} e^{2t+3} - \frac{1}{4} e^{2t+3} + C}$$