

$$\int P(x)e^{ax} dx$$

$$\int P(x) \cos bx dx$$

$$\int P(x) \sin bx dx$$

$$\begin{aligned} \int (x^2 e^{3x}) dx &= x^2 e^{3x} / 3 - \int (1/3 e^{3x} \cdot 2x) dx = \\ &= x^2 e^{3x} / 3 - 2/3 \int (x e^{3x}) dx = \\ &= x^2 e^{3x} / 3 - 2/3 \left(x e^{3x} / 3 - \int (1/9 e^{3x}) dx \right) + C = \\ &= x^2 e^{3x} / 3 - 2x e^{3x} / 9 + 2/27 e^{3x} + C \end{aligned}$$

$$\begin{aligned} u &= x^2 \\ dv &= e^{3x} dx \\ v &= 1/3 e^{3x} \\ du &= 2x dx \end{aligned}$$

$$\begin{aligned} \int (x e^{3x}) dx &= x e^{3x} / 3 - \int (e^{3x} / 3) dx = \\ &= x e^{3x} / 3 - 1/9 e^{3x} + C = \\ r &= x \\ dw &= e^{3x} dx \\ w &= e^{3x} / 3 \\ dr &= dx \end{aligned}$$