

Calculus Study Guide: section 5.6

Evaluate the integrals.

$$\int_0^3 x e^{-x^2} dx$$

$$\begin{aligned} u &= -x^2 \\ du &= -2x dx \\ -\frac{1}{2} du &= x dx \\ -\frac{1}{2} \int e^u du \\ &= -\frac{1}{2} e^u \end{aligned}$$

$$\begin{aligned} &-\frac{1}{2} e^{-x^2} \Big|_0^3 \\ &= -\frac{1}{2} (e^{-9} - e^0) \\ &= -\frac{1}{2} (e^{-9} - 1) \approx 0.5 \end{aligned}$$

answer: _____

$$\int_0^{\pi/4} \cos^3 x \sin x dx$$

$$\begin{aligned} u &= \cos x \\ du &= -\sin x dx \\ -du &= \sin x dx \\ -\int u^3 du \\ &= -\frac{1}{4} u^4 \end{aligned}$$

$$\begin{aligned} &-\frac{1}{4} \cos^4 x \Big|_0^{\pi/4} \\ &= -\frac{1}{4} (\cos^4 \frac{\pi}{4} - \cos^4 0) \\ &= -\frac{1}{4} (\frac{1}{4} - 1) = -\frac{1}{4} (-\frac{3}{4}) \\ &= \frac{3}{16} \end{aligned}$$

answer: _____