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MAC 2312.0703  
Cyr

Quiz 1

You must show all work to receive full credit!!

**Problem 1.** (2.5 pts) Evaluate  $\int x^3 e^{-x^2} dx$ .

u-sub  $u = -x^2 \quad du = -2x dx$

$$\begin{aligned} \int x^3 e^{-x^2} dx &= \frac{1}{2} \int (-x^2) e^{-x^2} (-2x dx) = \frac{1}{2} \int u e^u du \\ &= \frac{1}{2} [u e^u - e^u] + C \\ &= \boxed{\frac{-1}{2} x^2 e^{-x^2} - \frac{1}{2} e^{-x^2} + C} \end{aligned}$$

IBP

|   |       |
|---|-------|
| u | $e^u$ |
| 1 | $e^u$ |
| 0 | $e^u$ |

**Problem 2.** (2.5 pts) Evaluate  $\int 15 \sin^3 x \cos^2 x dx$ .

$$\begin{aligned} 15 \int \sin^3 x \cos^2 x dx &= 15 \int \sin^2 x \cos^2 x \sin x dx = 15 \int (1 - \cos^2 x) \cos^2 x \sin x dx \\ &= 15 \int (\cos^2 x - \cos^4 x) \sin x dx \quad \begin{array}{l} \text{u-sub} \quad u = \cos x \\ du = -\sin x dx \end{array} \\ &= -15 \int (u^2 - u^4) du \\ &= 15 \int (u^4 - u^2) du = 15 \left( \frac{u^5}{5} - \frac{u^3}{3} \right) + C \\ &= \boxed{3 \cos^5 x - 5 \cos^3 x + C} \end{aligned}$$