

Name: Solutions

(20 points total)

1. (10 points) Evaluate  $\int x^2 e^x dx$ .

$$\int \underbrace{x^2}_u \underbrace{e^x dx}_{dv} = x^2 e^x - \int \underbrace{2x}_u \underbrace{e^x dx}_{dv} = x^2 e^x - \left[ 2x e^x - \int 2e^x dx \right]$$

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

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

$$= x^2 e^x - \left[ 2x e^x - 2e^x \right] + C$$

2. (10 points) Evaluate  $\int \cos^4 x \sin^3 x dx$ .

$$\int \cos^4 x \sin^3 x dx = \int (\cos x)^4 (\sin x)^2 \sin x dx$$

$$= \int (\overset{u}{\cos x})^4 (1 - (\overset{u}{\cos x})^2) \overset{-du}{\sin x dx}$$

$$= - \int u^4 (1 - u^2) du$$

$$= - \int (u^4 - u^6) du$$

$$= - \left( \frac{u^5}{5} - \frac{u^7}{7} \right) + C$$

$$= - \left( \frac{\cos^5 x}{5} - \frac{\cos^7 x}{7} \right) + C$$