

3. $\int x^2 \ln x \, dx$ (5 points)

Integration by parts

$$\text{let } u = \ln x \quad u' = \frac{1}{x}$$

$$v = \frac{x^3}{3} \quad v' = x^2$$

$$\int x^2 \ln x \, dx = \frac{x^3}{3} \ln x - \int \frac{x^3}{3} \cdot \frac{1}{x} \, dx$$

$$= \frac{x^3}{3} \ln x - \int \frac{x^2}{3} \, dx$$

$$= \boxed{\frac{x^3}{3} \cdot \ln x - \frac{x^3}{9} + C}$$