

Each problem is worth 5 points. Show complete justification for full credit.

1. Find $\int x \ln x \, dx$.

$$u = \ln x \quad v = \frac{1}{2}x^2$$

$$du = \frac{1}{x} \quad dv = x \, dx$$

$$\int u \, dv = uv - \int v \, du$$

$$\int x \ln x \, dx = \frac{1}{2}(\ln x)(x^2) - \int \frac{1}{2}x^2 \left(\frac{1}{x}\right)$$

$$= \frac{x^2 \ln x}{2} - \frac{1}{2} \int x$$

Great

$$= \frac{x^2 \ln x}{2} - \frac{1}{4}x^2 + C$$

2. Find $\int x \sin(x^2) \, dx$.

$$\frac{1}{2} \int \sin u \, du$$

$$\frac{1}{2} [-\cos u]$$

$$\boxed{-\frac{1}{2} \cos x^2 + C}$$

$$u = x^2$$

$$du = 2x \, dx$$

$$\frac{du}{2} = x \, dx$$

Perfect!