

Please show **all** your work! Answers without supporting work will not be given credit.
Write answers in spaces provided.

Name: _____

1. [5 pts] Compute $\int_0^{\pi} 10x \sin(3x) dx$

Solution:

$$\begin{aligned} \int_0^{\pi} 10x \sin(3x) dx & \stackrel{\substack{u=10x \\ du=10 dx}}{\substack{dv=\sin(3x) dx \\ u=-\frac{1}{3} \cos(3x)}}}{=} \left[-\frac{10}{3} x \cos(3x) \right]_0^{\pi} - \int_0^{\pi} -\frac{10}{3} \cos(3x) dx \\ & = -\frac{10}{3} x \cos(3x) \Big|_0^{\pi} + \frac{10}{3} \int_0^{\pi} \cos(3x) dx \\ & = -\frac{10}{3} x \cos(3x) \Big|_0^{\pi} + \frac{10}{3} \cdot \frac{\sin(3x)}{3} \Big|_0^{\pi} \\ & = -\frac{10}{3} \pi \cos(3\pi) - \left(-\frac{10}{3} (0) \cos(3 \cdot 0) \right) + \frac{10}{9} \sin(3\pi) - \frac{10}{9} \sin(3 \cdot 0) \\ & = \frac{10}{3} \pi \end{aligned}$$

How I graded?

- **2 pt** for choice of u and dv
- **1 pt** for plugging everything into integration by parts formula
- **1 pt** for integration
- **1 pt** for final answer

2. [5 pts] Compute $\int \frac{\ln x}{x^4} dx$

Solution:

$$\begin{aligned}\int \frac{\ln x}{x^4} dx &= \int \ln x \cdot x^{-4} dx \stackrel{\substack{u=\ln x \\ du=x^{-1} dx}}{\substack{dv=x^{-4} dx \\ v=-\frac{1}{3}x^{-3}}} - \frac{1}{3}x^{-3} \ln(x) - \int -\frac{1}{3}x^{-3}x^{-1} dx \\ &= -\frac{1}{3}x^{-3} \ln(x) + \frac{1}{3} \int x^{-4} dx \\ &= -\frac{1}{3}x^{-3} \ln(x) + \frac{1}{3} \cdot \frac{1}{-3}x^{-3} + C \\ &= -\frac{1}{3x^3} \ln(x) - \frac{1}{9x^3} + C\end{aligned}$$

How I graded?

- 2 pt for choice of u and dv
- 1 pt for plugging everything into integration by parts formula
- 1 pt for integration
- 1 pt for final answer