

- **Work individually on this part.** There are four questions on two sides of the page.
- Show all work.
- No notes, calculators or electronic devices of any kind.
- You have 20 minutes to complete this part.

1. (5 points) Evaluate $\int_0^1 \frac{e^x - 1}{e^x - x} dx$.

$$u = e^x - x \quad du = (e^x - 1) dx$$

$$u(0) = 1 \quad u(1) = e - 1$$

$$\int_0^1 \frac{e^x - 1}{e^x - x} dx = \int_1^{e-1} \frac{1}{u} du = [\ln u]_1^{e-1}$$

$$= \ln(e-1) - \ln(1)$$

$$= \ln(e-1)$$

2. (5 points) Evaluate $\int \sec^4 x dx$.

$$\int \sec^4 x dx = \int \sec^2 x \sec^2 x dx$$

$$= \int (1 + \tan^2 x) \sec^2 x dx$$

$$u = \tan x \quad du = \sec^2 x dx$$

$$= \int (1 + u^2) du$$

$$= u + \frac{u^3}{3} + C$$

$$= \tan x + \frac{1}{3} \tan^3 x + C$$

3. (5 points) Evaluate $\int_0^1 x e^{3x} dx$. $= \left[\frac{x}{3} e^{3x} \right]_0^1 - \int_0^1 \frac{1}{3} e^{3x} dx$

$$\begin{aligned} u &= x & dv &= e^{3x} dx \\ du &= dx & v &= \frac{1}{3} e^{3x} \end{aligned} \quad = \left[\frac{x}{3} e^{3x} \right]_0^1 - \left[\frac{1}{9} e^{3x} \right]_0^1$$

$$= \frac{1}{3} e^3 - \frac{1}{9} e^3 + \frac{1}{9}$$

$$= \underline{\underline{\frac{2}{9} e^3 + \frac{1}{9}}}$$

4. (5 points) Evaluate $\int \arctan(2/x) dx$.

$$u = \arctan(2/x) \quad dv = dx$$

$$du = \frac{-2/x^2}{1 + 4/x^2} dx \quad v = x$$

$$= \frac{-2}{x^2 + 4} dx$$

$$\begin{aligned} \int \arctan(2/x) dx &= x \arctan(2/x) + \int \frac{2x}{x^2 + 4} dx \\ &= \underline{\underline{x \arctan(2/x) + \ln(x^2 + 4) + C}} \end{aligned}$$