Math 231. **Quiz 1.** **Individual part.** Name: _Solutions_

- **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 $\int_0^1 \dfrac{e^x + 1}{e^x + x} \, dx$.

$u = e^x + x \qquad du = (e^x + 1)\,dx$

$u(0) = 1 \qquad u(1) = e + 1$

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

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

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

2. (5 points) Evaluate $\int_0^1 x e^{2x}\, dx.$ $= \left[\dfrac{x}{2} e^{2x}\right]_0^1 - \int_0^1 \dfrac{1}{2} e^{2x}\, dx$

$u = x \qquad dv = e^{2x}\, dx$

$du = dx \qquad v = \dfrac{1}{2} e^{2x}$ $\qquad = \left[\dfrac{x}{2} e^{2x}\right]_0^1 - \left[\dfrac{1}{4} e^{2x}\right]_0^1$

$$= \frac{1}{2} e^2 - \frac{1}{4} e^2 + \frac{1}{4}$$

$$= \frac{1}{4} e^2 + \frac{1}{4}.$$

3. (5 points) Evaluate $\int \sec^4 x \; dx$.

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

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

$u = \tan x \qquad du = \sec^2 x \; dx$

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

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

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

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

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

$du = \dfrac{-2/x^2}{1 + 4/x^2} \; dx \qquad v = x$

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

$$\int \arctan(2/x) \; dx = x \arctan(2/x) + \int \frac{2x}{x^2 + 4} \; dx$$

$$= \underline{x \arctan(2/x) + \ln(x^2 + 4) + C}$$