

**Exercise 1.** Evaluate the following improper integrals:

(a)  $\int_{-\infty}^{\infty} \frac{e^x}{1 + e^{2x}} dx$

(b)  $\int_3^4 \frac{5}{(x - 4)^2} dx$

(c)  $\int_0^1 \frac{\ln x}{x} dx$

**Exercise 2.** Find  $y(x)$  satisfying the given differential equation (solving for  $C$  when initial conditions are given):

(a)  $(1 + x) \frac{dy}{dx} = (2 + x)(y - 1)$

(b)  $\frac{dy}{dx} = y \cos(3x + 2)$

(c)  $\frac{dy}{dx} = e^{y-x}$  with  $y(0) = 0$