

Additional Calculus Problems 3 (Integration and Differential Equations)

1. Evaluate the following integrals :

$$(a) \int \frac{x^4 - x^2 + 2}{x^2(x-1)} dx$$

$$(b) \int \frac{\cos x}{\sin^2 x - \sin x - 2} dx$$

2. Obtain the **general solutions** for the following differential equations:

$$(a) y^3 \frac{dy}{dx} + x^3 = 0$$

$$*(b) \frac{dy}{dx} = \frac{x^2 + y^2}{xy} \quad (\text{By considering the substitution } u = \frac{x}{y})$$

$$(c) \frac{dy}{dx} = (y + 4x)^2 \quad (\text{By considering the substitution } u = y + 4x)$$

$$(d) \frac{dy}{dx} = \frac{1 - 2y - 4x}{1 + y + 2x} \quad (\text{By considering the substitution } u = y + 2x)$$