Study Guide 1

Differentials and indefinite integrals

1. Compute the differentials of the functions below

(a) $y = 3x^2, \quad dy =$

(b) $u = e^{t^2}, \quad du =$

(c) $y = \ln(2x^3 + 1), \quad dy =$

(d) $w = s^2 e^{3s}, \quad dw =$

2. Compute the indefinite integrals below.

(a) $\displaystyle\int 3x^3 - 4x^2 + 3x + 2\,dx =$

(b) $\displaystyle\int 4\sqrt{t} + \frac{2}{\sqrt[3]{t}}\,dt =$

(c) $\displaystyle\int \frac{3x^2 + 2x - 1}{4x^3}\,dx =$

(d) $\displaystyle\int (x^2 + 1)(x + 3)^2\,dx =$

3. Find the function $y = f(x)$, given that $y' = x - \dfrac{1}{x}$, and $f(1) = 3$.

4. The marginal revenue function for a firm is

$$\frac{dr}{dq} = 200 - q^{2/3}.$$

Find the firm's demand function.

5. A firm's fixed cost is \$12000, and their marginal cost function is

$$\frac{dc}{dq} = (q + 1000)^{1/3} + 50.$$

Find the firm's cost function.