

Review Questions 2

Indefinite Integrals and Applications

1. Compute the following integrals

a. $\int \frac{3x \, dx}{\sqrt[3]{x^2 + 1}} =$

e. $\int \frac{3x \cdot e^{\sqrt{x^2+1}}}{\sqrt{x^2+1}} \, dx =$

b. $\int (x^2 + 2x)(x^3 + 3x^2 - 1)^3 \, dx =$

f. $\int 1000e^{-0.05t} \, dt =$

c. $\int \frac{dx}{x \ln x} =$

g. $\int \frac{t^2 + 5}{3t + 1} \, dt$

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

h. $\int \frac{2 + x}{2x + 1} \, dx =$

2. A firm's marginal cost function is $\frac{dc}{dq} = 2(5q + 100)^{1/2}$, and their fixed cost is \$10000. Find the firm's cost function.

3. A firm's marginal revenue and marginal cost functions are

$$\frac{dr}{dq} = 200 - (2q + 8)^{2/3} \quad \text{and} \quad \frac{dc}{dq} = 0.2q + 65,$$

respectively. How will the firm's **profit** change if output is increased from $q = 100$ to $q = 200$?

4. A firm's marginal revenue function is given by $\frac{dr}{dq} = 50 - \frac{(\ln(q + 1) + 1)^5}{q + 1}$. Find the firm's revenue function.

5. Suppose that a small nation's marginal propensity to consume is given by

$$\frac{dC}{dY} = \frac{63Y^2 + 70Y - 450}{(9Y + 5)^2},$$

where Y is income and C is consumption, both measured in billions of dollars.

a. Compute $\lim_{Y \rightarrow \infty} \frac{dC}{dY}$, and interpret your result in economic terms.

b. Find the function $C(Y)$, given that $C(5) = 4.5$.