

1. Evaluate the following integrals.

$$\text{a) } \int 3x^2 + 2x + 1 \, dx \quad \text{b) } \int e^{2x} \, dx \quad \text{c) } \int \frac{6x}{x^2 + 1} \, dx$$

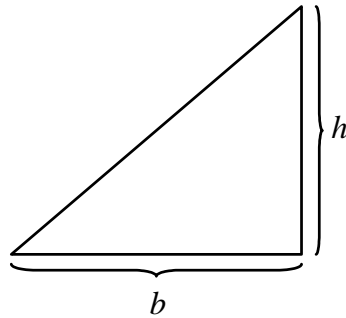
$$\text{d) } \int x^{1/2} \, dx, \quad F(0) = 5 \quad \text{e) } \int MC(Q) \, dQ, \quad MC(Q) = 10 + 4Q.$$

2. The marginal product of labor is given by

$$MP(L) = abL^{b-1}, \quad b > 0,$$

and the production function is  $Q = F(L)$ . Assume that  $F(0) = 0$ . Find the production function. For what values of  $b$  does the Law of Diminishing Marginal Returns hold?

3. Find the area of the following triangle using integral calculus.



Hint: Evaluate the integral

$$\int_0^b \frac{h}{b} x \, dx$$

4. Evaluate the integrals

$$\text{a) } \int_0^1 3x^2 \, dx \quad \text{b) } \int_0^9 x^{1/2} \, dx$$

5. Evaluate the integrals

$$\text{a) } \int_0^\infty Ae^{-rt} \, dt \quad \text{b) } \int_0^1 \frac{dx}{x}$$

6. Consider

$$\int_a^c x^b dx, \quad 0 \leq a < c.$$

- (a) Find the range of values of  $b$  for which this integral converges as  $a \rightarrow 0^+$ .
- (b) Find the range of values of  $b$  for which this integral converges as  $c \rightarrow +\infty$  (when  $a > 0$ )
- (c) Prove that  $\int_0^{+\infty} x^b dx$  diverges for all values of  $b$ .

7. Evaluate the following integrals.

a)  $\int \frac{6x}{x^2 + 1} dx$       b)  $\int \frac{x}{\sqrt{1+x}} dx$