# Exercise 3

A. Solve the following indefinite integrals.

1. $\int 5dx$
2. $\int 3x^2 dx$
3. $\int (4x^3 - 3x^2 + 1)dx$
4. $\int \frac{1}{x} dx$
5. $\int e^{x+1} dx$
6. $\int (3\sqrt[3]{x^2} + 1)dx$
7. $\int 4x^3 e^{x^4} dx$
8. $\int dx$
9. $\int \frac{x}{x^2 + 4} dx$

10 $\int \frac{x^2 - 1}{x^3 - 3x} dx$

B. Evaluate the following indefinite integrals, where the initial condition is x=0, y=0.

1. $\int 4dx$
2. $\int (1 - x)dx$
3. $\int (3x + 3)dx$
4. $\int (x^{\frac{1}{2}} + 3x^{-\frac{1}{2}})dx$

C. Find the area under the curve for the following definite integrals.

1. $\int_0^2 4dx$
2. $\int_{-1}^1 (1 - x)dx$
3. $\int_0^2 (x - 3)dx$
4. $\int_{-1}^1 (x^3 + x + 6)dx$
5. $\int_1^2 \frac{1}{x} dx$
6. $\int_1^2 e^x dx$

D. Find the value of the following indefinite in integrals, given the initial condition x=1, y=2.

1. $\int 4dx$

2. $\int (1 - x)dx$

3. $\int (x-3)dx$

4. $\int (x^3 + x + 6)dx$

5. $\int (x^{\frac{1}{2}} + 3x^{\frac{-1}{2}})dx$

E. If the MC is given as the following function and the Fixed Cost is 43,

$$MC = 32 + 18Q - 12Q^2$$

find;

i) the total cost function,
ii) the average cost function,
iii) the variable cost function,

F. Given the following supply and demand functions, find

$$P_D = 25 - 6Q \qquad P_S = 2 + 7Q$$

i) the equilibrium price and demand,
ii) show graphically, consumer's and producer's surplus,
iii) calculate consumer's and producer's surplus,

G. Given the following demand and supply functions for cruise passenger services in a region,

$$\text{Demand Equation} \quad P_d = 10\, e^{-\frac{Q}{10}}$$

$$\text{Supply Equation} \quad P_s = e^{\frac{Q}{10}}$$

i) Find the equilibrium freight rate,
ii) Find the consumers' surplus and producers' surplus,
iii) Show the consumers' surplus and producers' surplus on a graph.