

1. Find the following integrals :-

$$(a) \int \frac{dx}{x^5} \quad (b) \int_0^a (ax^2 - x^3) dx \quad (c) \int_1^2 \left(\frac{2}{x^2} - \frac{3}{x} + 4 \right) dx$$

$$(d) \int (e^{-x} + e^{4x}) dx \quad (e) \int_0^{\pi/3} (\sec^2 x + \cos x) dx \quad (f) \int \frac{4}{3x+1} dx$$

2. Integrate :-

$$(a) \int \frac{dx}{x^2 - 3x + 2} \quad (b) \int_2^3 \frac{(3x^2 + x)}{(x-1)(x+1)^2} dx \quad (c) \int \frac{x^2}{x-1} dx$$

3. By making suitable substitutions, or otherwise, find the following integrals :-

$$(a) \int e^{-(4x+3)} dx \quad (b) \int \frac{(x-1)}{\sqrt{(x^2 - 2x + 3)}} dx$$

$$(c) \int_0^{\pi/8} \sec^2 2x dx \quad (d) \int_0^2 (3x-1)(3x^2 - 2x)^4 dx$$

$$(e) \text{ Let } u = \cos x \text{ to find } \int 3 \cos^3 x \sin x dx.$$

4. Find the area enclosed by the curve $y = \frac{4}{x}$, the lines $y = 2$ and $y = 3$, and the y -axis.

5. Repeat question 4. for the curve $y = 2x^3 - 1$, the x -axis, the line $y = 2$, and the y -axis.

6. The area bounded by the curve $y = 1 - \cos x$ between $x = 0$ and $x = \frac{\pi}{2}$ is rotated 2π radians about the x -axis. Find the volume of the solid formed.

/Turn over

7. The area lying in the first quadrant and bounded by the curve $y = 2x^2 + 1$, the y -axis, and the lines $y = 2$ and $y = 5$ is rotated 2π radians about the y -axis. Calculate the volume of the solid formed.

8. An object accelerates from rest and proceeds in a straight line.

At time, t seconds, its acceleration is given by :-

$$a = 20 - 2t \text{ cm/s}^2$$

(a) Calculate the velocity of the object after 3 seconds.

(b) How far did the object travel in the first 8 seconds of motion ?