

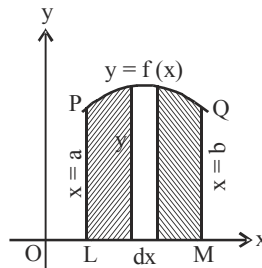
# 8

# APPLICATION OF THE INTEGRALS

## KEY CONCEPT INVOLVED

### Area Under Simple Curves

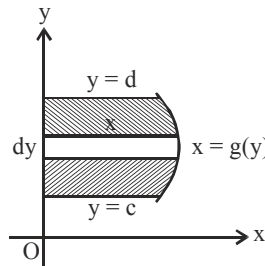
- Let us find the area bounded by the curve  $y = f(x)$ , x-axis and the ordinates  $x = a$  and  $x = b$ . Consider the area under the curve as composed of large number of thin vertical strips let there be an arbitrary strip of height  $y$  and width  $dx$ . Area of elementary strip  $dA = ydx$ , where  $y = f(x)$ . Total Area  $A$  of the region between x-axis, ordinates  $x = a$ ,  $x = b$  and the curve  $y = f(x) =$  Sum of areas of elementary thin strips across the region PQML



$$A = \int_a^b dA = \int_a^b ydx = \int_a^b f(x)dx$$

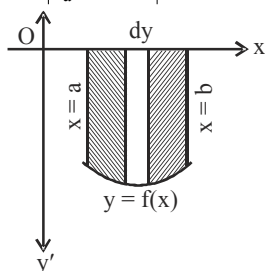
- The area  $A$  of the region bounded by the curve  $x = g(y)$ , y-axis and the lines  $y = c$  and  $y = d$  is given by

$$A = \int_c^d xdy$$



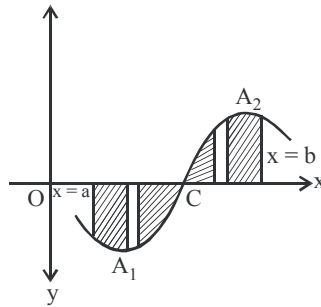
- If the curve under consideration lies below x-axis, then  $f(x) < 0$  from  $x = a$  to  $x = b$ , the area bounded by the curve  $y = f(x)$ , and the ordinates  $x = a$ ,  $x = b$  and x-axis is negative. But the numerical value of the area is to

be taken into consideration. Then Area =  $\left| \int_a^b f(x)dx \right|$



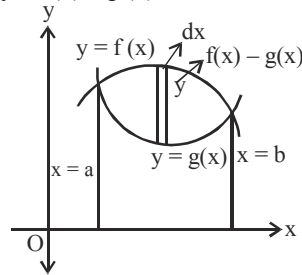
4. Let some portion of the curve is above x-axis and some portion is below x-axis. Let  $A_1$  be the area below x-axis and  $A_2$  be the area above of x-axis. Therefore Area bounded by the curve  $y = f(x)$ , x-axis and the ordinates  $x = a$  and  $x = b$ .

$$A = |A_1| + A_2$$



#### Area between Two curves

5. Let the two curves be  $y = f(x)$  and  $y = g(x)$ . Suppose these curves intersect at  $x = a$  and  $x = b$ . Consider the elementary strip of height  $y$  where  $y = f(x) - g(x)$  with width  $dx$

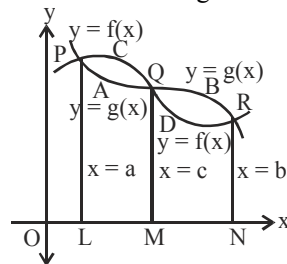


$$\therefore da = ydx$$

$$\Rightarrow A = \int_a^b (f(x) - g(x)) dx = \int_a^b f(x) dx - \int_a^b g(x) dx$$

i.e.  $A = \text{Area bounded by the curve } y = f(x) - \text{Area bounded by the curve } y = g(x)$

6. If the two curves  $y = f(x)$  and  $y = g(x)$  intersects at  $x = a$ ,  $x = c$  and  $x = b$  such that  $a < c < b$ . If  $f(x) > g(x)$  in  $[a, c]$  and  $f(x) < g(x)$  in  $[c, b]$ , Then the area of the regions bounded by curve.



$$= \text{Area of the region PAQCP} + \text{Area of the region QDRBQ} = \int_a^c (f(x) - g(x)) dx + \int_c^b (g(x) - f(x)) dx$$

# Class 12 Maths NCERT Solutions

NCERT Solutions	Important Questions	NCERT Exemplar
<a href="#">Chapter 1 Relations and Functions</a>	<b>Relations and Functions</b>	<a href="#">Chapter 1 Relations and Functions</a>
<a href="#">Chapter 2 Inverse Trigonometric Functions</a>	<a href="#">Concept of Relations and Functions</a>	<a href="#">Chapter 2 Inverse Trigonometric Functions</a>
<a href="#">Chapter 3 Matrices</a>	<a href="#">Binary Operations</a>	<a href="#">Chapter 3 Matrices</a>
<a href="#">Chapter 4 Determinants</a>	<a href="#">Inverse Trigonometric Functions</a>	<a href="#">Chapter 4 Determinants</a>
<a href="#">Chapter 5 Continuity and Differentiability</a>	<b>Matrices</b>	<a href="#">Chapter 5 Continuity and Differentiability</a>
<a href="#">Chapter 6 Application of Derivatives</a>	<a href="#">Matrix and Operations of Matrices</a>	<a href="#">Chapter 6 Application of Derivatives</a>
<a href="#">Chapter 7 Integrals Ex 7.1</a>	<a href="#">Transpose of a Matrix and Symmetric Matrix</a>	<a href="#">Chapter 7 Integrals</a>
<a href="#">Integrals Class 12 Ex 7.2</a>	<a href="#">Inverse of a Matrix by Elementary Operations</a>	<a href="#">Chapter 8 Applications of Integrals</a>
<a href="#">Integrals Class 12 Ex 7.3</a>	<b>Determinants</b>	<a href="#">Chapter 9 Differential Equations</a>
<a href="#">Integrals Class 12 Ex 7.4</a>	<a href="#">Expansion of Determinants</a>	<a href="#">Chapter 10 Vector Algebra</a>
<a href="#">Integrals Class 12 Ex 7.5</a>	<a href="#">Properties of Determinants</a>	<a href="#">Chapter 11 Three Dimensional Geometry</a>
<a href="#">Integrals Class 12 Ex 7.6</a>	<a href="#">Inverse of a Matrix and Application of Determinants and Matrix</a>	<a href="#">Chapter 12 Linear Programming</a>
<a href="#">Integrals Class 12 Ex 7.7</a>	<b>Continuity and Differentiability</b>	<a href="#">Chapter 13 Probability</a>
<a href="#">Integrals Class 12 Ex 7.8</a>	<a href="#">Continuity</a>	
<a href="#">Integrals Class 12 Ex 7.9</a>	<a href="#">Differentiability</a>	
<a href="#">Integrals Class 12 Ex 7.10</a>	<b>Application of Derivatives</b>	
<a href="#">Integrals Class 12 Ex 7.11</a>	<a href="#">Rate Measure Approximations and Increasing-Decreasing Functions</a>	
<a href="#">Integrals Class 12 Miscellaneous Exercise</a>	<a href="#">Tangents and Normals</a>	
<a href="#">Chapter 8 Application of Integrals</a>	<a href="#">Maxima and Minima</a>	
<a href="#">Chapter 9 Differential Equations</a>	<b>Integrals</b>	
<a href="#">Chapter 10 Vector Algebra</a>	<a href="#">Types of Integrals</a>	
<a href="#">Chapter 11 Three Dimensional Geometry</a>	<b>Differential Equation</b>	
<a href="#">Chapter 12 Linear Programming</a>	<a href="#">Formation of Differential Equations</a>	
<a href="#">Chapter 13 Probability Ex</a>	<a href="#">Solution of Different Types of Differential</a>	

<a href="#">13.1</a>	<a href="#">Equations</a>	
<a href="#">Probability Solutions Ex 13.2</a>	<b>Vector Algebra</b>	
<a href="#">Probability Solutions Ex 13.3</a>	<a href="#">Algebra of Vectors</a>	
<a href="#">Probability Solutions Ex 13.4</a>	<a href="#">Dot and Cross Products of Two Vectors</a>	
<a href="#">Probability Solutions Ex 13.5</a>	<b>Three Dimensional Geometry</b>	
	<a href="#">Direction Cosines and Lines</a>	
	<a href="#">Plane</a>	
	<a href="#">Linear Programming</a>	
	<b>Probability</b>	
	<a href="#">Conditional Probability and Independent Events</a>	
	<a href="#">Baye's Theorem and Probability Distribution</a>	

## RD Sharma Class 12 Solutions

<a href="#">Chapter 1: Relations</a>	<a href="#">Chapter 12: Higher Order Derivatives</a>	<a href="#">Chapter 23 Algebra of Vectors</a>
<a href="#">Chapter 2: Functions</a>	<a href="#">Chapter 13: Derivative as a Rate Measurer</a>	<a href="#">Chapter 24: Scalar Or Dot Product</a>
<a href="#">Chapter 3: Binary Operations</a>	<a href="#">Chapter 14: Differentials, Errors and Approximations</a>	<a href="#">Chapter 25: Vector or Cross Product</a>
<a href="#">Chapter 4: Inverse Trigonometric Functions</a>	<a href="#">Chapter 15: Mean Value Theorems</a>	<a href="#">Chapter 26: Scalar Triple Product</a>
<a href="#">Chapter 5: Algebra of Matrices</a>	<a href="#">Chapter 16: Tangents and Normals</a>	<a href="#">Chapter 27: Direction Cosines and Direction Ratios</a>
<a href="#">Chapter 6: Determinants</a>	<a href="#">Chapter 17: Increasing and Decreasing Functions</a>	<a href="#">Chapter 28 Straight line in space</a>
<a href="#">Chapter 7: Adjoint and Inverse of a Matrix</a>	<a href="#">Chapter 18: Maxima and Minima</a>	<a href="#">Chapter 29: The plane</a>
<a href="#">Chapter 8: Solution of Simultaneous Linear Equations</a>	<a href="#">Chapter 19: Indefinite Integrals</a>	<a href="#">Chapter 30: Linear programming</a>
<a href="#">Chapter 9: Continuity</a>	<a href="#">Chapter 20: Definite Integrals</a>	<a href="#">Chapter 31: Probability</a>
<a href="#">Chapter 10: Differentiability</a>	<a href="#">Chapter 21: Areas of Bounded Regions</a>	<a href="#">Chapter 32: Mean and variance of a random variable</a>
<a href="#">Chapter 11: Differentiation</a>	<a href="#">Chapter 22: Differential Equations</a>	<a href="#">Chapter 33: Binomial Distribution</a>

## JEE Main Maths Chapter wise Previous Year Questions

1. [Relations, Functions and Reasoning](#)
2. [Complex Numbers](#)
3. [Quadratic Equations And Expressions](#)
4. [Matrices, Determinants and Solutions of Linear Equations](#)
5. [Permutations and Combinations](#)
6. [Binomial Theorem and Mathematical Induction](#)
7. [Sequences and Series](#)
8. [Limits, Continuity, Differentiability and Differentiation](#)
9. [Applications of Derivatives](#)
10. [Indefinite and Definite Integrals](#)
11. [Differential Equations and Areas](#)
12. [Cartesian System and Straight Lines](#)
13. [Circles and System of Circles](#)
14. [Conic Sections](#)
15. [Three Dimensional Geometry](#)
16. [Vectors](#)
17. [Statistics and Probability](#)
18. [Trigonometry](#)
19. [Miscellaneous](#)

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- [NCERT Solutions for Class 12 English](#)
- [NCERT Solutions for Class 12 English Vistas](#)
- [NCERT Solutions for Class 12 English Flamingo](#)
- [NCERT Solutions for Class 12 Hindi](#)
- [NCERT Solutions for Class 12 Hindi Aroh \(आरोह भाग 2\)](#)
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