# Area Enclosed Between Two Curves

**SUBJECT : MATHEMATICS**
**CHAPTER NUMBER:8**
**CHAPTER NAME :Application of Integrals**



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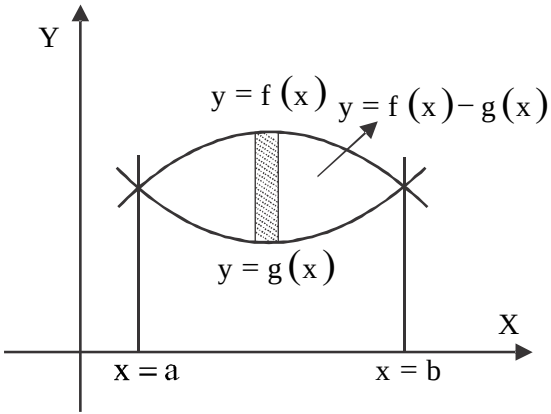
# Area Enclosed Between two Curves

Suppose two curves are given by $y = f(x)$ and $y = g(x)$ and their points of intersection are given by $x = a$ and $x = b$, then for finding the area between these two curves we have two conditions.

**(a) When $f(x) \geq g(x)$ in $[a, b]$**

Suppose $f(x) \geq g(x)$ in $[a, b]$ then take a vertical strip whose width is dx and length is $f(x) - g(x)$.

Then the area $A = \int_a^b [f(x) - g(x)]\, dx$



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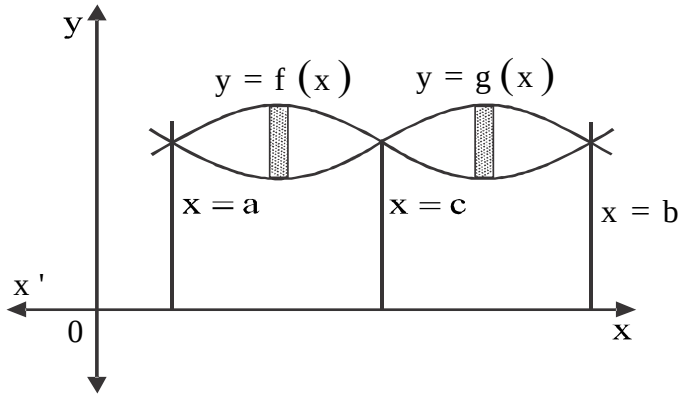
**(b) When $f(x) \geq g(x)$ in $[a, c]$ and $0 \leq f(x) \leq g(x)$ in $[c, b]$ where a < c < b.**

Suppose $f(x) \geq g(x)$ in $[a, c]$ and $f(x) \leq g(x)$ in $[c, b]$ then we take two vertical strips, one strip in $[a, c]$ and the second strip in $[c, b]$.

Area = $\int_a^c \big(f(x) - g(x)\big)dx + \int_c^b \big(g(x) - f(x)\big)dx$



# Working Rule For Finding Area Between two Curves

Suppose two curves $y = f(x)$ and $y = g(x)$ are given to us, then for finding the area of the region between two curves we use the following steps.

**Step-1** Draw the rough sketches of both given curves and identify the region bounded by them.

**Step-2** Find the point of intersection of both curves.

**Step-3** Take the limit for the bounded region and draw the strips (one or two).

**Step-4** Now find the area by using a suitable formula.

# Example

Find the area of the region bounded by two parabolas $y = x^2$ and $y^2 = x$.

# Example

Find the area of the region included between the line $y = x$ and the parabola $x^2 = 4y$.

# Example

Find the area of the region bounded by the curve $x^2 = 4y$ and the line $x = 4y - 2$ .

# Example

Find the area of the region enclosed between the two circles $x^2 + y^2 = 1$ and $(x-2)^2 + y^2 = 4$.

# Assignment

1. Find the area of the region enclosed between the two circles $x^2 + y^2 = 4$ and $(x - 2)^2 + y^2 = 4$.

2. Using integration finds the area of the region bounded by a parabola $y^2 = 4x$ and circle $4x^2 + 4y^2 = 9$.

3. Find the area bounded by parabola $y^2 = 4x$ and the line $y = 3x - 4$.

4. Exercise 8.1 from NCERT book.

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