10+2 PCM NOTES

BY

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(PDF version handwritten notes of Maths, Physics and Chemistry for 10+2 competitive exams like JEE Main, WBJEE, NEST, IISER Entrance Exam, CUCET, AIPMT, JIPMER, EAMCET etc.)

10+2

With best wishes from Joyoshish Saha

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Area of Bounded Regions.

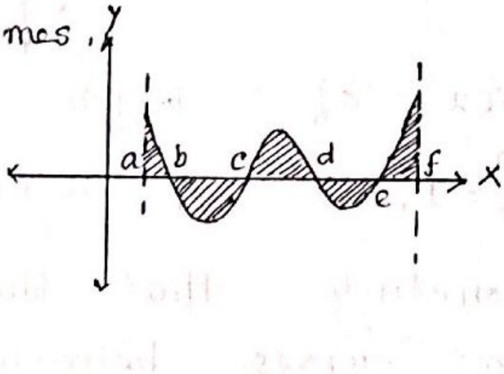
* **Graphing the function:** i) finding the domain of definition of the function. ii) determining the odd-even nature of function. iii) finding the period of the function. iv) finding asymptotes and tangent at the origin. v) Checking behaviour of function for $x \to 0\pm$. vi) finding the values of x, if possible for which $f(x) \to 0$. vii) finding interval of increase and decrease and the local maximas - minimas.

* **Sign Convention for finding the areas using integration:** $\int_a^b f(x)\,dx$.

Case-I: If $b > a$ and $f(x) > 0 \ \forall \ x \in [a, b]$, then it will give the area between $f(x)$, x axis and $x = a$, $x = b$.

Case-II: If $b > a$ & $f(x) < 0 \ \forall \ x \in [a, b]$, then $\left| \int_a^b f(x)\,dx \right|$ is the required area.

Case-III: If $f(x)$ changes sign a number of times,



then Area =

$$\int_a^b f(x)\,dx + \left| \int_b^c f(x)\,dx \right| + \int_c^d f(x)\,dx + \left| \int_d^e f(x)\,dx \right| + \int_e^f f(x)\,dx$$

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* Area between given Curves:

(I) Non intersecting: $A = \int_a^b \{f(x) - g(x)\}\, dx$.

provided $f(x) > g(x)\ \forall\ x \in [a,b]$.

(II) Intersecting: If point of intersection is $x = c$,

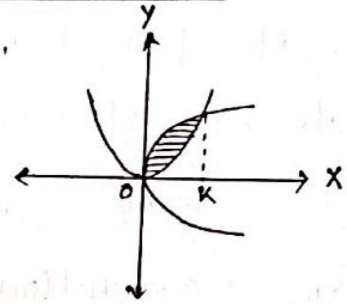
then $A = \int_a^c \{f(x) - g(x)\} dx + \int_c^b \{g(x) - f(x)\} dx$.

or, $A = \int_a^b |f(x) - g(x)|\, dx$.

* Standard areas to be remembered:

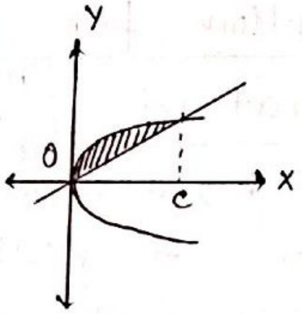
1. $y^2 = 4ax$, $x^2 = 4by$; $a, b > 0$.

$$\boxed{A = \frac{16}{3} ab.}$$



2. $y^2 = 4ax$, $y = mx$.

$$A = \frac{8a^2}{3m^3}$$

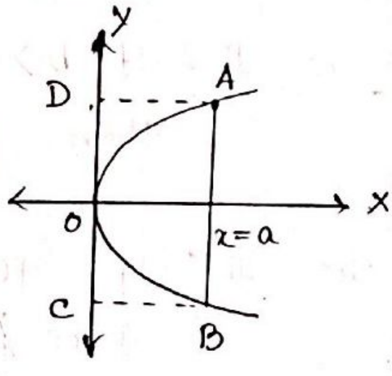


3. $y^2 = 4ax$ and its double ordinate at $x = a$

$$A = \int_0^a (2\sqrt{ax})\, dx$$

also,

$$A = \frac{2}{3}\left[Ar(ABCD) \right].$$



4. Whole area of ellipse.

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1. \qquad A = \pi ab$$

* We can conclude that the area bounded by the two curves between $x = a$ & $x = b$ is

$$\int_a^b (\text{curve lying above} - \text{curve lying below})\, dx.$$

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Area

* To find asymptotes for a curve, find out x in terms of y and check there exist any real y for which $x \to \pm\infty$ then y equal to that real number will be an asymptote for the curve. And also, find y in terms of x and check for any real x, $y \to \pm\infty$, if there exists any such real number x, then x equal to the real number is an asymptote to the curve.

* Some important points on curve sketching:

• Vertical and Horizontal Shifts:

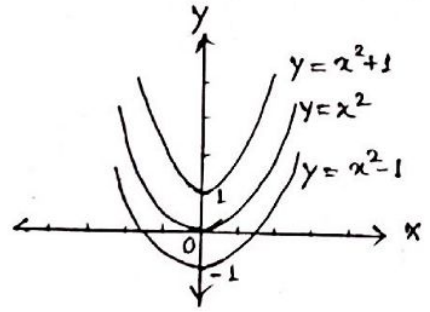
If $a>0$ & $y=f(x)$ is known,

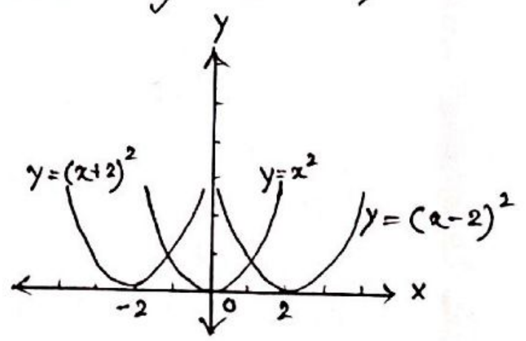
i) shifted upward a unit — $y=f(x)+a$ curve.

ii) shifted downward a unit — $y=f(x)-a$ curve.

iii) Shifted rightward a unit - $y=f(x-a)$ curve.

iv) shifted leftward a unit - $y=f(x+a)$ curve.





• Vertical & horizontal Stretching:

i) stretched vertically by a unit - $y=a\cdot f(x)$ curve.

ii) compressed vertically by a unit - $y=\frac{1}{a}\cdot f(x)$

iii) stretched horizontally - $y=f\left(\frac{x}{a}\right)$.

iv) compressed horizontally - $y=f(ax)$

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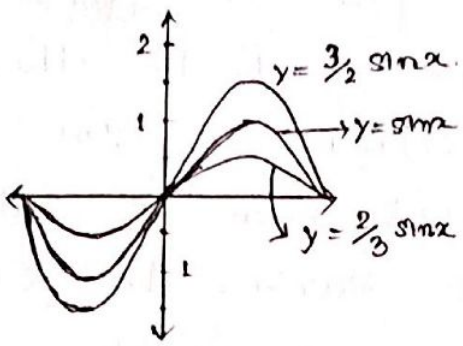

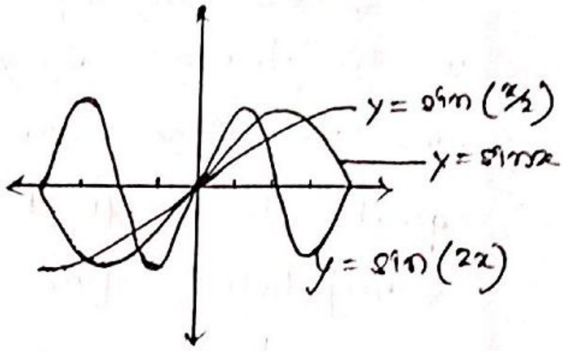

- Reflection of graph:

i) reflected by the x-axes - $y = -f(x)$ curve.

ii) reflected by the y-axis - $y = f(-x)$ curve.

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