

Detailed Course on Differential Equation for IIT JAM' 23 - II



Gajendra Purohit



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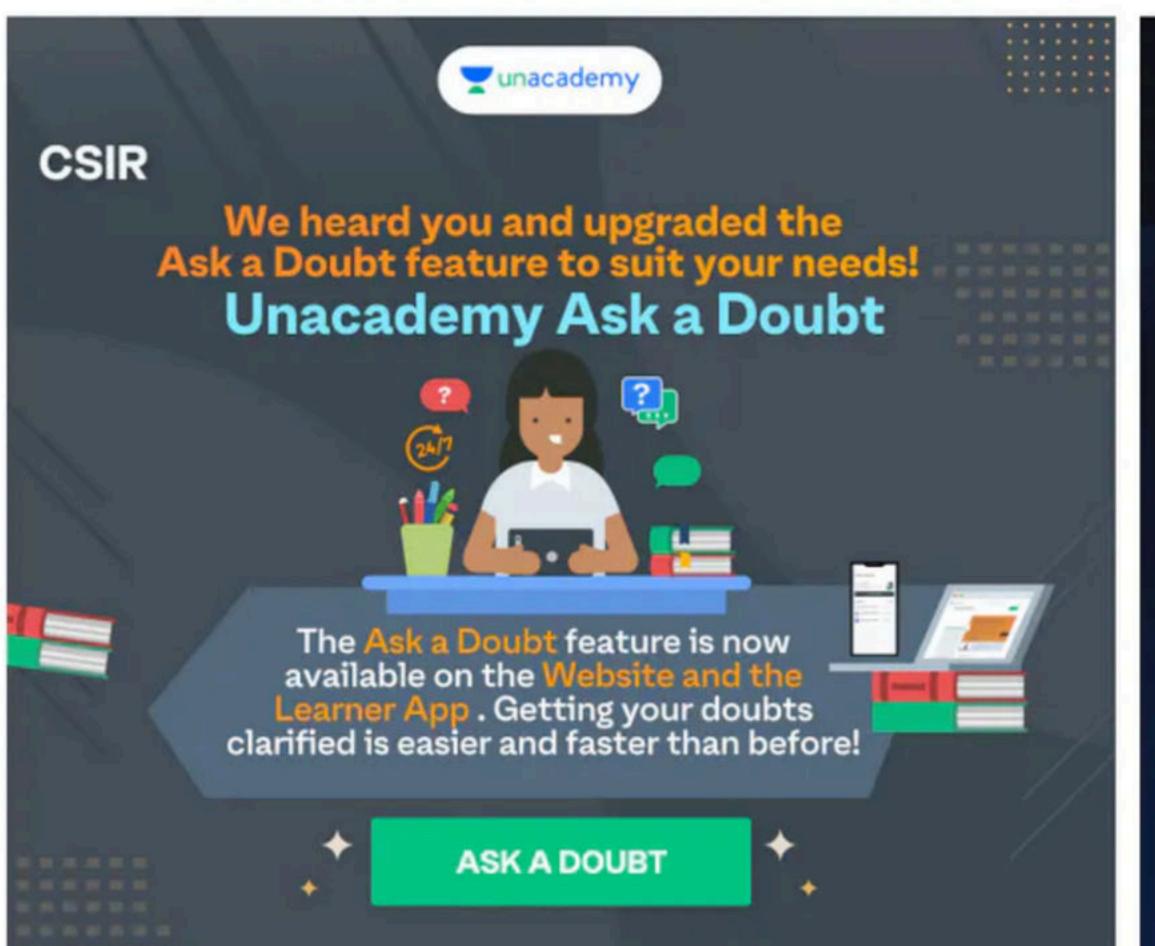
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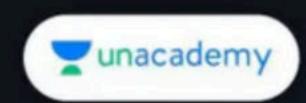
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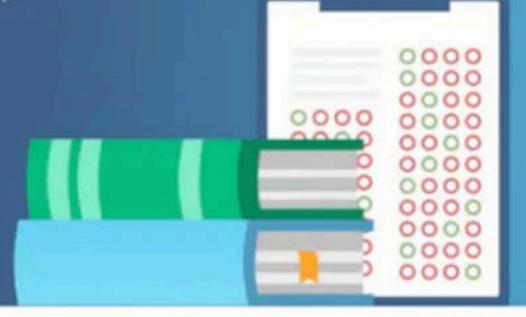
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TRAJECTORIES

A curve which cuts every members of a given family of curve in accordance with same given law is called trajectory of the given family of curve.

Types of Trajectory

- (1) Orthogonal trajectory: If a curve cuts every member of given family of curves at right angle, it is called an orthogonal trajectory.
- Oblique trajectory: If a curve cuts every member of a given family of curves at an angle α(≠90°), it is called an oblique trajectory.

Determination of orthogonal trajectories in Cartisian coordinates:

Step - 1: Differentiate the given equation of the family of curves, eliminate the parameter.

Step -2: Replace dy/dx by -dx/dy.

Step - 3: Solve this new DE and we obtain orthogonal trajectory.

Self orthogonal family of curves:

If each member of a given family of curves intersects all other members orthogonally then given family of curves is said to be self orthogonal.

Note: The differential equation of the family of curve is identical with differential equation of its orthogonal trajectories.

Q.1

Which one of the following curves is the orthogonal trajectory of straight line passing through fixed (5, 6)?

A)
$$(x-5)^2 = c(y-6)$$

B)
$$(x-5)=c(y-6)$$

A)
$$(x-5)^2 = c(y-6)$$

B) $(x-5) = c(y-6)$
C) $(x-5)^2 + (y-6)^2 = c$
D) None of these

Q.2. The value of $a \in R$ for which the curves $x^2 + ay^2 = 1$ and $y = x^2$ intersect orthogonally is

$$(a) - 2$$

(b)
$$\frac{-1}{2}$$

(c)
$$\frac{1}{2}$$

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Q.3. The integral curves of the first order linear differential equation $x \frac{dy}{dx} + ay = 0$ will be orthogonal to the family

of hyperbolas $x^2 - by^2 = c$ if and only if

A)
$$a + b = 0$$

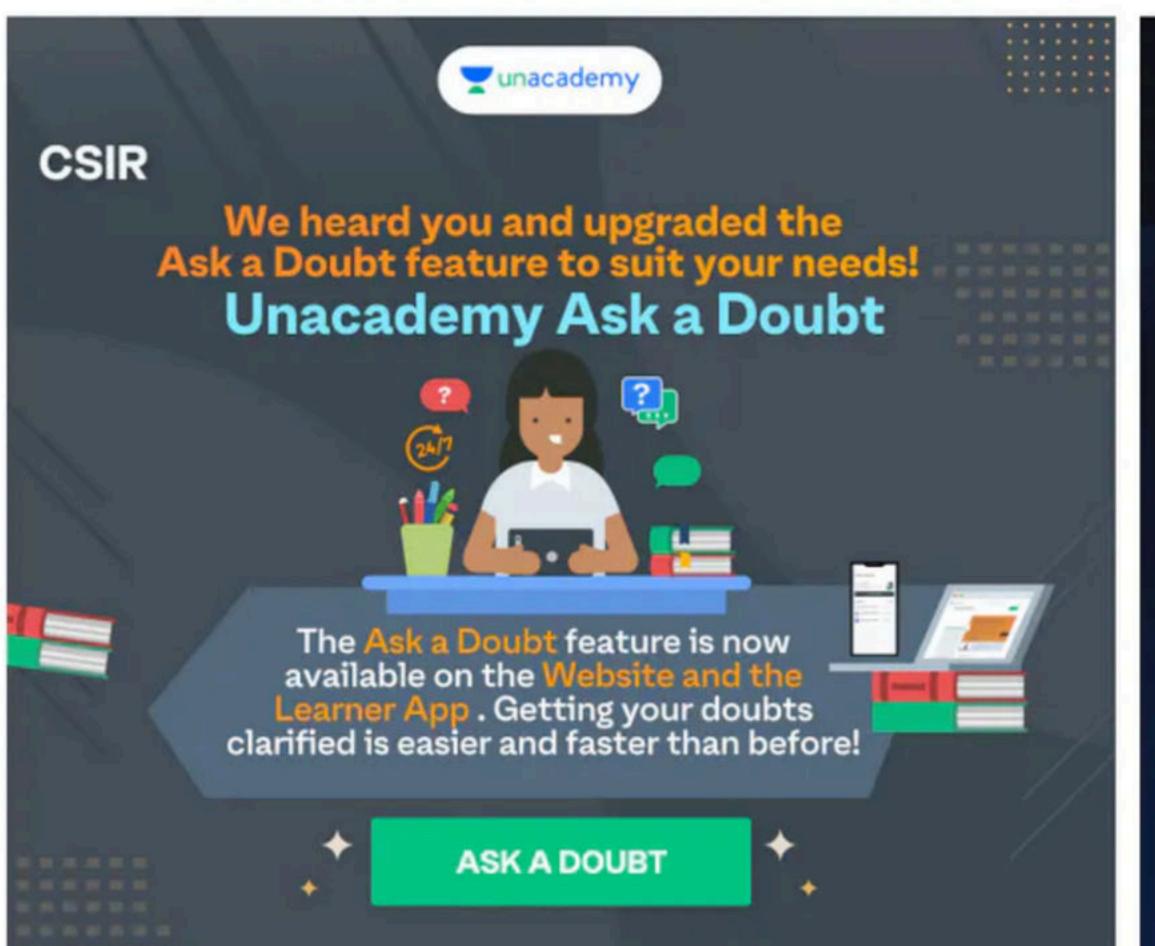
B)
$$a b = 1$$

$$C) \qquad a-b=0$$

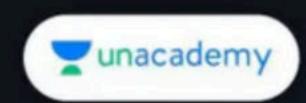
D)
$$a b = -1$$

Q.4. The orthogonal trajectories of family of curves $3xy = x^3 - a^3$, a being paramter of family, is of the form $x^2 = y + f(y)$ and satisfies y(0) = 0. then $f(\log 2)$ is

(a) 0.37
(b) -0.37
(c) 0.40
(d) 0.5







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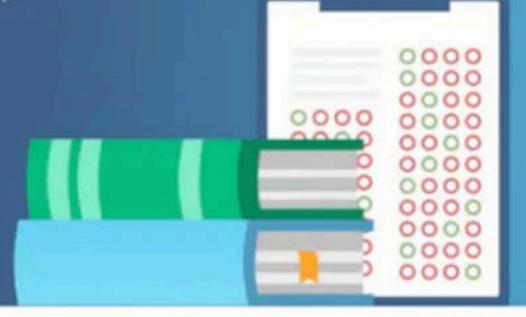
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Educator Profile





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Educator highlights

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Works at Pacific Science College

- Studied at M.Sc., NET,
 PhD(Algebra), MBA(Finance),
 BEd
- PhD, NET | Plus Educator For CSIR NET | Youtuber
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- Lives in Udaipur, Rajasthan,
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