



MATHS

BOOKS - PATHFINDER MATHS (BENGALI ENGLISH)

APPLICATION OF DERIVATIVES

Question Bank

1. The distance S metres moved by a particle traveling in a straight line in t second is given

by $S = 45t + 11t^2 - t^3$. Find the time when the particle comes to rest.



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2. If $R(x)$ rupees is the total revenue received from the sale of x tables and $R(x) = 600x - \frac{x^3}{25}$, find the marginal revenue when $x = 25$.



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3. The radius of a spherical balloon is decreasing at the rate of 10 cm per second. At what rate is the surface area of the balloon decreasing when its radius is 15 cm?



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4. At what point of the ellipses $16x^2 + 9y^2 = 400$, does the ordinate decrease at the same rate at which the abscissa increases?





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5. A particle moves along the curve $6y = x^3 + 2$. Find the points on the curve at which the y-coordinate is changing 8 times as fast as the x-coordinate.



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6. A ladder 16 cm long is leaning against a wall. The bottom of the ladder is pulled along the ground, away from the wall, at the rate of 2

cm/sec. How fast is its height on the wall decreasing when the foot of the ladder is 4 cm away from the wall?



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7. Water is leaking from a conical funnel at the rate of $5 \text{ cm}^3/\text{sec}$. If the radius of the base of the funnel is 5 cm and the altitude is 10 cm, find the rate at which the water level is dropping when it is 2.5 cm from the top.



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8. Show that $f(x) = \left(\frac{1}{2}\right)^x$ is strictly decreasing on \mathbb{R} .



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9. Show that $\tan x - x$ is strictly increasing on $\left(0, \frac{\pi}{2}\right)$.



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10. Show that the following function is strictly increasing : $f(x) = x^2, x > 0$.



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11. Find the intervals on which the following function is strictly increasing and strictly decreasing : $\frac{x}{\log x}, x > 0$.



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12. Find the intervals on which the following function is strictly increasing and strictly decreasing : $f(x) = 2x^3 + x^2 - 20$.



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13. Find the intervals on which the following function is strictly increasing and strictly decreasing : $f(x) = 2x^3 + x^2 - 20$.



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14. Find the slopes of the tangents and normals to the following curve: $x = a \cos^3 \theta$,
 $y = a \sin^3 \theta$ at $\theta = \frac{\pi}{4}$.



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15. Show that the tangents to the curve
 $y = x^2 - 5x + 6$ at the point (2,0) and (3,0)
are at right angle.



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16. Find the equations of the tangent and normal to the curve $y = x^2 - 4x - 5$ at $x = -2$.



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17. Find the equation of the tangent to the

ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at $(x = 1, y = 1)$.



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18. For the curve $y = 4x^3 - 2x^5$, find all the points at which the tangent passes through

the origin.



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19. Find the equation of the normal to the curve $3x^2 - y^2 = 8$ which is parallel to the line $x+3y=4$.



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20. Show that the curve $xy = a^2$ and $x^2 + y^2 = 2a^2$ touch each other.



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21. Prove that the curves $x = y^2$ and $xy = k$ cut at right angles* if $8k^2 = 1$.



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22. Find the angle of intersection of the curve

$$x^2 + y^2 - 4x - 1 = 0 \quad \text{and}$$

$$x^2 + y^2 - 2y - 9 = 0.$$



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23. If $y = x^4 - 10$ and if x change from 2 to 1.99, what is the approximate change in y ?



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