MATHS

BOOKS - MAHAVEER PUBLICATION

DIFFERENTIATION OR DERIVATIVE OF A FUNCTION

Question Bank

1. Find from the definition of derivative

f'(1) if $f(x) = x^2 - 2x + 3$

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2. Find the derivatives of the followings from the 1^{st} principle.

x^2

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3. Find the derivatives of the followings from the 1^{st} principle.

1/x

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4. Find the derivatives of the followings from the 1^{st} principle.

$\sin^2 x$

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5. Prove that f(x)=|x-k|, k is constant, $x \in R$ is not differentiable at x=k.

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6. Find (dy)/(dx) if

$$y = \sqrt{1 + x^2}$$

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7. Find (dy)/(dx) if

$$y = \cos \sqrt{x + 2}$$

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8. Find (dy)/(dx) if

$$y = \left(x^2 + x + 1\right)^4$$

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9. Find (dy)/(dx) if

$$y = \left(ax^2 + bx + c\right)^n$$

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10. Find (dy)/(dx) if

$$y = (2x + 1)\left(3x^2 - 1\right)^3$$

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11. Find $\frac{dy}{dx}$ if $y = \sin f(x)$

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12. Find (dy)/(dx) if

y=sec f(x)

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13. Find (dy)/(dx) if

y=cos(a cos x+bsin x)

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14. Find (dy)/(dx) if

$y = \sin^3 x \cos^2 x$

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15. Find (dy)/(dx) if

$$y = \tan\left\{(ax - b)^n\right\}$$

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16. Find (dy)/(dx) if

$$y = \cot x$$

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17. Find (dy)/(dx) if

$$y = \sec\left(\tan\sqrt{x}\right)$$

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18. Find dy/dx if

$$x^2 + y^2 = a^2$$

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19. Find dy/dx if

$$x^3 + y^3 = 3xy$$

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20. Find dy/dx if

$$x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$$

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21. Find dy/dx if

$$\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 1$$

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22. Find dy/dx if

$$x^m y^n = (x+y)^{m+n}$$

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23. Find dy/dx if

xy=cos(x+y)

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24. Find dy/dx if

$xy + y^2 = \tan x + y$

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25. Find dy/dx if

$$y = \sqrt{\left[\sin x + \sqrt{\left\{\sin x + \sqrt{(\sin x + \ldots .)}\right]}\right.}}$$

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26. Find dy/dx if

$x = at^2$, y=2at

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27. Find dy/dx if

$$x = \frac{2at}{1+t^2}, y = \frac{a(1-t^2)}{1+t^2}$$

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28. Find dy/dx if

$$x = r\cos\theta, y = r\sin\theta$$

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29. Find dy/dx if

$x = a\cos^3\theta, y = b\sin^3\theta$

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30. Find dy/dx if

$x = a(\theta + \sin\theta), y = a(1 - \cos\theta)$

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31. Find dy/dx if

$$\sin x = \frac{2t}{1+t^2}, \cos y = \frac{1-t^2}{(1+t)^2}$$

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32. Find dy/dx if

x=a(t+sint), y=a(1+cos t) at $t = \frac{\pi}{2}$

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33. A particle is moving in a straight line according to the law $S = t^3 + 2t^2 + 3t - 4$, where S is displacement and t is time. Find the velocity and acceleration when t=2.

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34. For a particle moving along a straight line, the relation between the velocity and the displacement at any instant is given by $v^2 = S^2 + 2S^2 + 3$

Find the acceleration of the particle when it is at a distance of 4 meters from a fixed point on the line.

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35. A particle is moving in a straight line is at a distance S from a point O on the line in time t, where $S = t^3 - 6t^2 + 8t + 5$.Find the velocity when the acceleration is $12cm/\sec^2$.

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36. The radius of a circle is increasing at the rate of $0.7cm/s$. What is the rate of increase of its circumference ?

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37. At what point of the parabola $y^2 = 18x$, does the ordinate increase at twice the rate of the abscissa ?

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38. A particle moves along a 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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39. The sides of an equilateral triangle increases at the rate of $\sqrt{3}cm/\sec$. What will be the rate of increase in area of the triangle when the length of a side is 5 cm ?

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40. The length x of a rectangle is decreasing at the rate of 5 cm/minute and the width y is increasing at the rate of 4 cm/minute.When x=8cm and y=6cm, find the rates of change of the perimeter.

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41. The length x of a rectangle is decreasing at the rate of 5 cm/minute and the width y is increasing at the rate of 4 cm/minute.When

x=8cm and y=6cm, find the rates of change of the area of the rectangle.

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42. A spherical balloon is inflated such that its radius is increasing at the rate of $\frac{1}{11} cm/\sec$ .At what rate would the volume be increasing at the instant when the radius is 7 cm ? $\left[\pi = \frac{22}{7}\right]$

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43. The radius of a spherical button is increasing at the rate $10cm/\sec$. Find the rate of change of its surface area when its radius is 4 cm.

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44. The side of a square is increasing at the rate of $0.01cm/s$. Find the rate of change of its area at the instant when each side is 4 cms.

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45. The side of a cube is increasing at the rate of $0.02cm/\sec$. Find the rate at which its surface area is increasing when its sides are 3 cms each.

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46. A man is walking away from the foot of a tower of height 40m at the rate of $4km/hour$ .Find the rate at which his distance from the

top of the tower is increasing when he is 30m away from the bottom of the tower.

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47. Find the slope of the tangent to the curve $y = x^4 - 4x^2 + 8$ at (1,5)

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48. Find the slope of the tangent to the curve y=(1+x)sin x at $x = \frac{\pi}{4}$

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49. Find the inclination to the positive x-axis of the tangent to the curve $y = -3x - x^4$ at the point where x=-1

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50. Find the point on the curve $y = 4x - x^2$ where the tangent is parallel to the x-axis.

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51. Show that, the tangent at no point on the curve $y = x^3 + 3x$ can be parallel to the x-axis.

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52. Find the slope of the tangents to the curve $y = x^2(x + 3)$ at the points where it crosses the x-axis.

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53. The slope of the tangent to the curve $y = ax^3 + b$ at the point (2,3) is 4. Find a and b

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54. Find the equation of the tangent and normal to the curve $y = x^2 + x + 1$ at (1,1).

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55. Find the equations of the tangents to the curve $\sqrt{x}+\sqrt{y}=3$ at (4,1)

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56. Find the equation of the tangent and normal to the circle $2x^2+2y^2-3x-4y+1=0$ at the point (1,2)

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57. Find the equation of normal to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}-1$ at the point (3,4).

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58. Find the equation of the tangent and the normal at the point 't' on the curve x=a(t+sint), y=a(1-cost)

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59. Find the points on the curve $y = x^3 - 2x^2 + x$ at which the tangents are parallel to x-axis. Also find the tangents at these points.

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60. Find the equation of the tangents to the curve y=(x-1)(x-2) at the points where the curve cuts the x-axis.

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61. Find the tangent to the curve $xy^2 = 4(4 - x)$ at the point where it is cut by the line y=x

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62. The equation of a tangent to the parabola $y^2 = 8x$ which makes an angle 45° with the line y = 3x + 5 is

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63. Find the coordinates of the points on the curve $y = x^2 + 3x + 4$, the tangents at which pass through the origin.

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64. Find the angle between the two curves $y = 2x^2$ and $y = x^2 + 4x - 4$

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65. Find the acute angle between the two curves $y = x^2$ and $y = (x-3)^2$

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66. Find $\frac{d^2y}{dx^2}$ if $y = 2x^3 - 3x^2 + 5x - 7$

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67. Find $\frac{d^2y}{dx^2}$ if

$$y = \frac{x-1}{x+1}$$

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68. Find $\frac{d^2y}{dx^2}$ if

$$y = \log\left(x + \sqrt{x^2 + a^2}\right)$$

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69. Find $\frac{d^2y}{dx^2}$ if

$y = \sin^3 x . \cos x$

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70. Find $\frac{d^2y}{dx^2}$ if

$y = \tan^{-1} 2x$

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71. Find $\frac{d^2y}{dx^2}$ if

$y = e^x . \tan x$

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72. Find $\frac{d^2y}{dx^2}$ at x=2 if $y = x^3 + \log x$

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73. If $y = A\cos\sqrt{k}x + B\sin\sqrt{k}x$, prove that

$y_2 + ky = 0$

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74. If $y = \left(\sin^{-1} x\right)^2$, then prove that $\left(1 - x^2\right) y_2 - x y_1 = 2$

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75. If $y = \left(\tan^{-1} x\right)^2$, show that $\left(x^2 + 1\right)^2 y_2 + 2x\left(x^2 + 1\right) y_1 = 2$.

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76. If $y = ae^{3x}$, then prove that $\frac{d^2y}{dx^2} = 9y$.

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77. If $y = e^{ax} \cos bx$, then prove that :

$$\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + \left(a^2 + b^2\right)y = 0.$$

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78. Without using derivative, find the maximum value and the minimum value, if any,

of the function f defined by

$f(x) = -(x-1)^2 + 10, x \in \square$

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79. Without using derivative, find the maximum value and the minimum value, if any, of the function f defined by

$f(x) = |x|, x \in \square$

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80. Without using derivative, find the maximum value and the minimum value, if any, of the function f defined by

$f(x) = x + 1, x \in]-1, 1[$

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81. Find the local maximum, local minimum, absolute maximum and absolute minimum values, if any, using first or second derivative

test of the function f defined by :

$f(x) = x^3 - 9x^2 + 15x - 1$

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82. Find the local maximum, local minimum, absolute maximum and absolute minimum values, if any, using first or second derivative test of the function f defined by :

$f(x) = x^5 - 5x^4 + 5x^3 - 10$

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83. Find the local maximum, local minimum, absolute maximum and absolute minimum values, if any, using first or second derivative test of the function f defined by :

$$f(x) = 2x^3 - 3x^2 - 12x + 1, x \in \left[-2, \frac{5}{2}\right]$$

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84. Show that $f(x) = x^3 - 6x^2 + 24x + 4$ has neither maxima nor minima.

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85. Find from the Definition of Derivative:

$f'\left(\frac{\pi}{4}\right)$ where $f(x) = \sec x$

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86. Find the derivatives of the followings from the 1^{st} principle.

$x^2 + \frac{1}{x^2}$

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87. Find the derivatives of the followings from the 1^{st} principle.

$$\frac{x}{1-x}$$

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88. Find the derivatives of the followings from the 1^{st} principle.

$\cos^2 x$

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89. Examine the differentiability at x=0 and x=1:

$$f(x) = \begin{cases} -x & x < 0 \\ x^2 & 0 \leq x \leq 1 \\ x^3 - x + 1 & x > 1 \end{cases}$$

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90. Examine the differentiability at x=0,1,2 if:

$$f(X) = \begin{cases} 4 - x & x \leq 0 \\ 5x + 4 & 0 < x \leq 1 \\ 4x^2 - 3x & 1 < x < 2 \\ 3x + 4 & x \geq 2 \end{cases}$$

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91. Find the sum $1 + 2x + 3x^2 + \ldots\ldots + nx^{n-1}$ from the relation

$$1 + x + x^2 + x^3 + \ldots\ldots + x^n = \frac{1 - x^{n+1}}{1 - x}$$

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92. Prove that the derivative of an even function is an odd function and that of an odd function is an even function.

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93. Find dy/dx if

$$y = \left(x^2 + 2x + 3\right)^5$$

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94. Find dy/dx if

$$y = \frac{1}{\sqrt{a^2 + x^2}}$$

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95. Find dy/dx if

$$y = x^4 \sin 3x$$

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96. Find dy/dx if

$$y = \frac{1 - \cos x}{1 + \cos x}$$

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97. $y = \dfrac{\sin x + \cos x}{\sin x - \cos x}$

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98. Find dy/dx if

$y = \sin^3 x + \cos^6 x$

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99. Find dy/dx if

$y = \sec \sqrt{2x + 3}$

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100. Find dy/dx if

$$y = \tan \sqrt{a^2 + x^2}$$

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101. Find dy/dx if

$$y = \sin \sqrt{a^2 + x^2}$$

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102. Find dy/dx if

$$y = \sqrt{1 + \cot x}$$

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103. Find dy/dx if

$$y = \left(\cos x^3\right)\left(\sin^2 x^5\right)$$

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104. $\cos\left(\sin\sqrt{ax + b}\right)$

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105. Find dy/dx if

$x^3 + y^3 = a^3$

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106. Find dy/dx if

$2x^2 + 5xy + 3y^2 = 0$

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107. Find dy/dx if

$$3x^4 - 2x^2y^2 + 5xy^3 - 4y^4 = 0$$

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108. Find dy/dx if

$$x(y - x)^2 = x + y$$

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109. Find dy/dx if

$$x\sqrt{1+y}+y\sqrt{1+x}=0$$

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110. Find dy/dx if

$$xy=\sin(x+y)$$

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111. Find dy/dx if

tan(x+y)+tan(x-y)=1

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112. Find dy/dx if

$x = t^7 + 1, y = t^5 + 3t^3$

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113. Find dy/dx if

$x = a\sec\theta, y = b\tan\theta$

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114. Find dy/dx if

x=a(t+sint), y=bcost

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115. Find dy/dx if

x=a(t+cost), y=a(t+sint)

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116. Find dy/dx if

$x = \cos\theta + \theta\sin\theta, y = \sin\theta - \theta\cos\theta$

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117. Find dy/dx if

$x = a\sec^2\theta, y = b\tan^3\theta$

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118. A particle describes a distance S meter in t seconds, where $S = 7t^6 + 4t^4 - 11$.What will be its velocity and acceleration after 2 seconds ?

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119. A particle moves in a straight line according to the law $S = at^2 + bt + c$.If at the ends of 3 seconds, it has covered 20 cms, attained velocity $9cm/\sec$ and has acceleration $4cm/\sec^2$, find a,b,c.

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120. Find the rate of change of the area of a circle with respect to its radius r when r = 3cm

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121. Find the rate of change of the area of a circle with respect to its radius r when r = 4cm

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122. The radius of a circle is increasing uniformly at the rate of $3cm/s$.Find the rate at which the area of the circle is increasing when the radius is 10 cm.

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123. The rate of change of radius of a circle is $\frac{1}{\pi} cm/\sec$. Find the rate of change of circumference of the circle and area bounded by the circle when its radius is 4 cm.

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124. Find the point on the curve $y^2 = 8x$ at which the abscissa and the ordinate change at the same rate.

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125. A balloon, which always remains spherical on inflation, is being inflated by pumping in 900 cubic centimeters of gas per second. Find the rate at which the radius of the balloon increases when the radius is 15 cm.

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126. A balloon, which always remains spherical , has a variable diameter 3/2(2x+1). Find the rate of change of its volume with respect to x.

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127. A man 1.5 m tall walks away from a lamp post 4.5 m high at a rate of 4 km/hr. (i) How fast is his shadow lengthening?

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128. Sand is pouring from a pipe at the rate of 12 cm^3/s . The falling sand forms a cone on the ground in such a way that the height of the cone is always one-sixth of the radius of

the base. How fast is the height of the sand cone increasing when t

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129. Find the slope of the tangent to the curve $y\left(x^2+1\right)=x$ at the point (1, 1/2)

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130. Find the inclination to the positive x-axis of the tangent to the curve

$2y = 2 - x^2$ at the point (1, 1/2)

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131. Find the points at which the tangent to the curve $y = \frac{x^4}{4} - 2x^2$ is parallel to the x-axis.

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132. Find the points on the circle $x^2 + y^2 = 16$ at which the tangents are perpendicular to

the y-axis and the x-axis.

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133. Find the point on the curve $y = 2x^2$ at which the slope of the tangent is 6.

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134. Find the slope of the normal to the $curvex = 1 - a\sin\theta, y = b\cos^2\theta$ at $\theta = \frac{\pi}{2}$.

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135. Find the point on the curve $y = (x - 2)^2$ at which the tangent is parallel to the chord joining the points (2,0) and (4,4).

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136. Find the point on the curve $y = x^3 - 11x + 5$ at which the tangent is $y = x \quad 11$.

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137. Find the equation of all lines having slope 1that are tangents to the curve $y = \frac{1}{x-1}, x \neq 1.$

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138. Find the equations of all lines having slope 0 which are tangent to the curve $y = \frac{1}{x^2 - 2x + 3}.$

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139. Find the equation of the tangent to the curve.

$x^2 + 5y^2 = 9$ at (2,-1)

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140. The equation of tangent to the curve $x^2 + y^2 + xy = 3$ at (1,1) is

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141. Find the equation of the tangent to the curve.

$y^2 = 4x + 5$ at (1,3)

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142. Find the equation of the normal to the curve

$y\left(x^2 + 4\right) = 16$ at (2,2)

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143. Find the equation of the normal to the curve

$x^2 - 4y^2 = 9$ at (5,-2)

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144. Find the equation of tangent and normal to the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 2$ at (1,1)

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145. Find the equation of tangent and normal to :

The curve $y = 2x^2 - 4x + 3$ at (2,3)

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146. Find the equation of tangent and normal to the parabola $y^2 = 4ax$ at the point $(at^2, 2at)$.

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147. Find the equation of tangent and normal to :

Parbola $y^2 = 16x$ at the point $(1, 4)$

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148. Find the equation of the tangent to the curve $y = \sqrt{3x - 2}$ which is parallel to the line $4x - 2y + 5 = 0$

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149. Find the equation of the normal to the curve $3x^2 - y^2 = 8$ which are parallel to the line $x + 3y - 5 = 0$

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150. Find the equation of the tangent line to the curve $y = x^2 - 2x + 7$ which is perpendicular to the line $5y - 15x = 13$.

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151. Find the equations of tangent and normal to the curve at the point where it crosses the x-axis.

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152. Prove that the sum of the x and y intercepts made by the tangent to the curve $\sqrt{x}+\sqrt{y}=\sqrt{a}$ at any point on it's is a constant

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153. Find $\frac{d^2y}{dx^2}$ if:

y=secx-tanx

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154. Find $\frac{d^2y}{dx^2}$ if:

$y = x^2 \cos x$

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155. Find $\frac{d^2y}{dx^2}$ if:

sinx+cosy=1

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156. Find $\frac{d^2y}{dx^2}$ if:

$y^2 = a^2 \cos^2 x + b^2 \sin^2 x$

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157. Find $\frac{d^2y}{dx^2}$ if:

$x^3 + y^3 - 3axy = 0$

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158. If $x\sqrt{1-y^2} + y\sqrt{1-x^2} = 0$, find the value of $\frac{d^2y}{dx^2}$ when y=1

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159. If $\sqrt{y}+\frac{1}{\sqrt{y}}=2x$, show that $(x^2-1)y_2+xy_1-4y=0$

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160. Without using derivative, find the maximum value and the minimum value, if any, of the function f defined by

f(x)=3+|x+1|, $x \in R$

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161. Without using derivative, find the maximum value and the minimum value, if any, of the function f defined by

$f(x) = x^2, x \in R$

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162. Without using derivative, find the maximum value and the minimum value, if any, of the function f defined by

$f(x) = x^3, x \in [-1, 1]$

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163. Find the local maximum, the local minimum values, if any, using first or second derivative test of the function f defined by

$f(x) = 3x^4 - 20x^3 + 36x^2 + 12$

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164. Find the local maximum, the local minimum values, if any, using first or second

derivative test of the function f defined by

$$f(x) = 1 + \frac{1}{x} + \frac{1}{x^2}$$

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165. Find the values of x, if any, for which f(x) has local maximum and local minimum when

$$f(x) = 5x^6 - 18x^5 + 15x^4 - 10$$

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166. Find the values of x, if any, for which f(x) has local maximum and local minimum when

$f(x) = x\sqrt{1-x}, x \leq 1$

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167. Find the values of x, if any, for which f(x) has local maximum and local minimum when

$f(x) = x^3(x-1)^2$

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168. Find the values of x, if any, for which f(x) has local maximum and local minimum when

$f(x) = \sin x + \cos x, x \in [0, 2\pi]$

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169. Find the local maximum, local minimum, absolute maximum and absolute minimum values of

$f(x) = x^4 - 2x^2 + 5, x \in [-2, 5]$

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170. Find the local maximum, local minimum, absolute maximum and absolute minimum values of

$f(x) = x(x-1)^2, x \in [0, 2]$

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171. Show that $f(x) = 3x - x^3$ has a local maximum at x=1.

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172. Show that $f(x) = x^2 + \frac{250}{x}$ has a local minimum at x=5.

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173. Show that $f(x) = 1 + x + x^2 + x^3$ has no local extremum.

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174. Show that $f(x) = x^3 - 3x^2 + 15x + 2$ has no local extremum.

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175. Find the extreme values of the function $y = 2x^3 - 9x^2 + 12x + 5$

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176. Find the maximum and minimum values of the function $y = 4x^3 - 3x^2 - 6x + 1$

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177. Find two positive numbers x and y such that

x+y=28 and xy is maximum.

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178. Find two positive numbers x and y such that

x+y=64 and $x^3 + y^3$ is minimum.

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179. Find two positive numbers x and y such that

x+y=400 and xy^3 is maximum.

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180. Find two positive numbers x and y such that

xy=36 and x+y is minimum.

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181. Find the point on the curve $y^2 = 4x$ which is nearest to the point $(2,\ 1)$.

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182. Find the coordinates of a point on the parabola $y = x^2 + 7x + 2$ which is closest to the straight line $y = 3x - 3$.

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183. Show that the largest rectangle with a given perimeter is a square.

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184. Show that of all the rectangles inscribed in a given circle, the square has the maximum area.

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185. Show that the triangle of maximum area that can be inscribed in a given circle is an equilateral triangle.

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186. Consider an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

What is the area of the greatest rectangle that can be inscribed in the ellipse?

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187. Let AP and BQ be two vertical poles at points A and B respectively. If $AP = 16m$, $BQ = 22m$ and $AB = 20m$, then find the distance of a point R on AB from the point A such that $RP^2 + RQ^2$ is minimum.

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188. If the length of three sides of a trapezium other than base are equal to 10 cm, then find the area of trapezium when it is maximum.

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189. Show if $f(x)=|x|$ is differentiable for all x.

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190. If f(x) and g(x) are differentiable for all, x then

$$\frac{d}{dx}(f(g(x))) = f'(g(x)).\, g'(x)$$

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191. If f is differentiable, then

$$\frac{d}{dx} f\left(\sqrt{x}\right) = \frac{f'\left(\sqrt{x}\right)}{2\sqrt{x}}.$$

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192. Derive $\frac{d}{dx}(\tan x) = \sec^2 x$

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193. If

$f(x) = (1+x)\left(1+x^2\right)\left(1+x^3\right)\left(1+x^4\right),$

then f'(0)=1

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194. If f(x)=7x-8, then f'(3)=

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195. Show that the equation of the tangent line to the parabola $y = x^2$ at (-2,4) is y-4=-4(x+2).

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196. Write True/False:

If for any function y=f(x), f'(c)=0, then the

tangent drawn to the curve at x=c is parallel to the y-axis.

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197. If $f'(x) = \frac{1}{(3-x)^2}$, the equation of the tangent line to f(x) at $\left(0, \frac{1}{3}\right)$ is $y = \frac{x}{9} + \frac{1}{3}$.

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198. Write True/False:

All critical points of f(x) satisfy f'(x)=0

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199. Write True/False:

If f'(c) does not exist and f'(x) changes from positive to negative as x increases through c, then f(x) has a local minimum at x=c.

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200. Write True/False:

If f'(c) exists and $f'(c) > 0$, then f(x) has a

local minimum at x=c.

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201. Write True/False:

If f(x) has an absolute maximum at x=c, then f'(c)=0

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202. Write True/False:

If f'(c)=0 then f(x) has a local maximum or a

local minimum at x=c

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203. Let y=f(x) and z=g(x) be two curves. Then the tangents drawn to curves at the intersection of these curve is perpendicular to each other if and only if f'(x).g'(x)=-1

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204. Given, $f(x) = x^3 - 5x + 2$. Then f'(2) equals

A. $3x^2 - 5$

B. 2

C. 7

D. 8

Answer: C

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205. $\frac{d}{dx}\left(\sin x^2\right) = ?$

A. $2x\cos x^2$

B. $2x\sin x^2$

C. 2xcosx

D. 2xcos(2x)

Answer: A

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206. Differentiate $ax^2 + b$

A. $-2ax$

B. 2ax

C. 2ax+b

D. ax+2b

Answer: B

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207. $\frac{d}{dx}\left[\frac{(x+1)^3}{x}\right] = ?$

A. $\frac{3(x+1)^2}{x} + \frac{(x+1)^3}{x^2}$

B. $\frac{3(x+1)^2}{x} \cdot \frac{(x+1)^3}{x^2}$

C. $\frac{2(x+1)^2}{x} - \frac{(x+1)^3}{x^2}$

D. $\frac{3(x+1)^2}{x} + \frac{2(x+1)^3}{x^2}$

Answer: B

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208. The derivative of y=|x-2| at x=2 is

A. 1

B. -1

C. 0

D. None of these

Answer: D

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209. Given the polar equation r=1. find $\frac{dy}{dx}$.

A. $\cot\theta$

B. $\tan\theta$

C. 0

D. $-\cot\theta$

Answer: D

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210. The slope of the normal to the curve $y = 2x^2 + 3\sin x$ at $x = 0$ is :

A. 3

B. $\frac{1}{3}$

C. -3

D. $-\frac{1}{3}$

Answer: D

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211. The line $y = x + 1$ is a tangent to the curve $y^2 = 4x$ at the point:

A. (1,2)

B. (2,1)

C. (1,-2)

D. (-1,2)

Answer: A

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212. The slope of the tangent line to the curve $y = x^3 - 2x + 1$ at x=1 is

A. 1

B. $\frac{1}{2}$

C. $\frac{1}{3}$

D. $\frac{1}{4}$

Answer: A

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213. Find the slope of the line whose parametric equations are x=4t+6 and y=t-1

A. -4

B. 44200

C. 4

D. $\frac{1}{4}$

Answer: B

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214. The slope of the tangent line to the curve x+y=xy at the point (2,2) is

A. -1

B. -2

C. -3

D. -4

Answer: A

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215. Find the coordinates of the vertex of the parabola $y = x^2 - 4x + 1$ by making use of the fact that at the vertex, the slope of the tangent is zero.

A. (2,-3)

B. (3,-2)

C. (-1,-3)

D. (-2,-3)

Answer: A

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216. Find the point in the parabola $y^2 = 4x$ at which the rate of change of the ordinate and abscissa are equal.

A. (1,2)

B. (2,1)

C. (4,4)

D. (-1,4)

Answer: A

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217. Find the eqaution of the normal to $x^2 + y^2 = 5$ at the point (2,1)

A. x+2y=0

B. x-2y=0

C. y-2x=0

D. y+2x=0

Answer: B

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218. Find the point on the curve $y = 3x^2 - 4x + 5$ where the tangent line is parallel to the line y=-22x+7

A. (0,5)

B. (-1,12)

C. (2,25)

D. (-3,34)

Answer: D

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219. The edge of the cube is increasing at a rate of $2cm/hr$.How fast is the cube's volume changing when its edge is $\sqrt{2}$cm in length ?

A. $6cm^3 / hour$

B. $12cm^3 / hour$

C. $3\sqrt{2}cm^3 / hour$

D. $6\sqrt{2}$

Answer: B

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220. Suppose y'+y=0. Which of the following is a possibility for y=f(x)

A. y=tanx

B. y=secx

C. y=sinx

D. $y = \frac{1}{x}, x \neq 0$

Answer: C

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221. Suppose f is a function such that $f'(x) = 4x^3$ and $f''(x) = 12x^2$. Which of the following is true ?

A. f has a local maximum at x=0 by the 1^{st} derivative test

B. f has a local minimum at x=0 by the 1^{st} derivative test

C. f has a local maximum at x=0 by the 2^{nd} derivative test

D. f has a local minimum at x=0 by the 2^{nd} derivative test

Answer: D

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222. In the curve $y = 2 + 12x - x^3$, find the critical points.

A. (2,18) and (-2,-14)

B. (2,18) and (2,-14)

C. (-2,18) and (2,-14)

D. (-2,18) and (-2,14)

Answer: A

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223. What is the acute angle between the curves xy=2 and $y^2 = 4x$ at their point of intersection ?

A. $\frac{\pi}{3}$

B. $\frac{\pi}{6}$

C. $\tan^{-1}(3)$

D. $\pm\tan^{-1}(3)$

Answer: C

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