1. A firm knows that the demand function for one of its product is linear. It also knows that it can sell 1400 units when the price is ₹4 per unit and it can sell 1800 units at a price ₹2 per unit.Find the marginal revenue function of this product.

2. Find the intervals in which the function $f(x) = x^4 - 4x^3 + 6x^2 - 4x + 1$ is increasing or decreasing.

3. If $\sqrt{1-x^2} + \sqrt{1-y^2} = 4(x-y)$,then show that $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$.

4. If $f'(x) = 3x^2 - 4x - \frac{2}{x^3}$ and $f(1) = 0$, then find $f(2)$.

5. A window is in the form of a rectangle mounted by a semi-circular opening. The total perimeter of the window is 10 m. Find the dimensions of the rectangular part of the window to admit maximum light through the whole opening.

6. Divide the number 8 into two positive numbers such that the sum of the cube of one and the square of the other is minimum.

7. If $e^x + e^y = e^{x+y}$, then $\frac{dy}{dx}$ is:

   (a) e^{y-x}

   (b) e^{x+y}

   (c) $-e^{y-x}$

   (d) $2e^{x-y}$

8. $If y = 5\cos x - 3\sin x$, then $\frac{d^2y}{dx^2}$ is equal to

   (a) -y

   (b) y

   (c) 25y

   (d) 9y

9. The points on the curve $\frac{x^2}{9} + \frac{y^2}{16} = 1$ at which the tangents are parallel to y-axis are:

   (a) $(0, \pm 4)$

   (b) $(\pm 4, 0)$

   (c) $(\pm 3, 0)$

   (d) $(0, \pm 3)$

(Differentiation 2021)

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