

## CBSE-12<sup>th</sup>

### MATHEMATICS- DIFFERENTIATION

TIME: 1hr. 15 min

MM: 35

1. Differentiate w.r.t.  $x$  to the function  $f(x) = x^a + a^x$ . (2)
2. Differentiate w.r.t.  $x$  to the function  $f(x) = \tan^{-1} \frac{(3a^2x - x^3)}{(a^3 - 3ax^2)}$ . (3)
3. If  $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ . Find  $dy/dx$ . (2)
4. If  $\sin y = x \sin(a + y)$  Prove that  $y_1 = \sin^2(a + y)/\sin a$ . (3)
5. Differentiate  $y = x^x + y^y$ . (3)
6. Prove that the derivative of an odd function is an even function and derivative of an even function is an odd function. (3)
7. If  $x = 2\cos\theta - \cos 2\theta$  and  $y = 2\sin\theta - \sin 2\theta$ , prove that  $dy/dx = \tan(3\theta/2)$ . (3)
8. If  $x^2 + y^2 = (t - t^{-1})$ ,  $x^4 + y^4 = t^2 + t^{-2}$ , prove that  $x^3 y y_1 = 1$ . (5)
9. If  $y = |x|^2 - 3|x| + |x - 1|$ , find  $dy/dx$ . (2)
10. If  $x = \sec\theta - \cos\theta$  and  $y = \sec^n\theta - \cos^n\theta$ , prove that  $(x^2 + 4) \left(\frac{dy}{dx}\right)^2 = n^2(y^2 + 4)$ . (4)
11. If  $xy \log(x + y) = 1$ , Prove that  $dy/dx = -[y(x^2y + x + y)] / [x(xy^2 + x + y)]$ . (3)
12. Differentiate w.r.t.  $x$ ,  $f(x) = \tan^{-1} \sqrt{\frac{1 - \cos 5x}{1 + \cos 5x}}$ . (2)

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