

NCERT/CBSE MATHEMATICS CLASS 12 textbook

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MISCELLANEOUS EXERCISES

Answers to NCERT/CBSE MATH (Class XII) textbook

Chapter 5

CONTINUITY AND DIFFERENTIABILITY

11. $x^{x^2-3} + (x-3)^{x^2}$, for $x > 3$

$$11. \frac{d}{dx} [x^{x^2-3} + (x-3)^{x^2}] = \frac{d}{dx} x^{x^2-3} + \frac{d}{dx} (x-3)^{x^2} = \frac{d}{dx} u + \frac{d}{dx} v \text{ (say)}$$

where, $x^{x^2-3} = u$; $(x-3)^{x^2} = v$

$$\frac{d}{dx} x^{x^2-3} :$$

$$u = x^{x^2-3}$$

$$\log u = (x^2 - 3) \log x$$

$$\Rightarrow \frac{1}{u} \frac{du}{dx} = (x^2 - 3) \frac{d}{dx} \log x + \log x \frac{d}{dx} (x^2 - 3)$$

$$\Rightarrow \frac{1}{u} \frac{du}{dx} = (x^2 - 3) \frac{1}{x} + \log x (2x)$$

$$\Rightarrow \frac{du}{dx} = x^{x^2-3} \left[(x^2 - 3) \frac{1}{x} + (2x) \log x \right]$$

Let $v = (x-3)^{x^2}$

$$\Rightarrow \log v = x^2 \log(x-3)$$

$$\Rightarrow \frac{1}{v} \frac{dv}{dx} = x^2 \frac{d}{dx} \log(x-3) + \log(x-3) \frac{d}{dx} x^2$$

$$\Rightarrow \frac{1}{v} \frac{dv}{dx} = x^2 \frac{1}{x-3} + \log(x-3)(2x)$$

$$\Rightarrow \frac{dv}{dx} = (x-3)^{x^2} \left[\frac{x^2}{x-3} + (2x) \log(x-3) \right]$$

$$\therefore \frac{d}{dx} [x^{x^2-3} + (x-3)^{x^2}] = x^{x^2-3} \left[(x^2 - 3) \frac{1}{x} + (2x) \log x \right] + (x-3)^{x^2} \left[\frac{x^2}{x-3} + (2x) \log(x-3) \right]$$

Please do not copy the answer given here

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