

Tutorial-5

Pg: 01

Continuity and Differentiability.

Prepared By: Rvi Panchal

1) Show that the f' of given $f(x) = \begin{cases} x^3 + 3, & x \neq 0 \\ 1, & x = 0 \end{cases}$ is not continuous at $x=0$ * Prove that $f(x) = |x-1|$ is not differentiable at $x=1$

2) check the continuity for $f(x) = |x|$. * Find the differentiation
1) $2\sqrt{\cot(x^2)}$

3) Discuss the continuity for $f(x) = \begin{cases} x+2, & x \leq 1 \\ x-2, & x > 1 \end{cases}$ 2) $\sin(2x+3)$
 $\cos(3x+4)$

* Find all points of discontinuity of f . 3) $\cos x^3 \cdot \sin^2(x^5)$
* Find $\frac{dy}{dx}$:

1) $f(x) = \begin{cases} |x|+3, & x \leq -3 \\ -2x, & -3 < x < 3 \\ 6x+2, & x > 3 \end{cases}$ 1) $\sin^2 y + \cos xy = k$

2) $f(x) = \begin{cases} x^{10}-1, & x \leq 1 \\ x^2, & x > 1 \end{cases}$ 2) $y = \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right), 0 < x < 1$

3) $f(x) = \begin{cases} \frac{\sin x}{x}, & x < 0 \\ x+1, & x > 0 \end{cases}$ 3) $y = \sin^{-1} (2x\sqrt{1-x^2}), \frac{1}{\sqrt{2}} < x < \frac{1}{\sqrt{2}}$

* Find the value of k so that f' is continuous at given point 4) $y^x + x^y + x^x = a^b$

$f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x}, & x \neq \frac{\pi}{2} \\ 3, & x = \frac{\pi}{2} \end{cases}$ at $x = \frac{\pi}{2}$ 5) $\sqrt{\frac{(x-1)(x-2)}{(x-3)(x-4)(x-5)}}$

6) $x = a (\cos t + \log \tan \frac{t}{2})$
 $y = a \sin t$

7) $x = \sqrt{a \sin^2 t}$ show that $\frac{dy}{dx} = -\frac{y}{x}$
 $y = \sqrt{a \cos^2 t}$

* Find the second order derivatives Pg:02

1) $e^{6x} \cos 3x$

2) $\tan^{-1} x$

3) $x^3 \log x$

* If $y = 5 \cos x - 3 \sin x$ then P.T. $\frac{d^2 y}{dx^2} + y = 0$

* If $y = 3e^{2x} + 2e^{3x}$ then P.T. $\frac{d^2 y}{dx^2} - 5 \frac{dy}{dx} + 6y = 0$

* Examine Roll's theorem for

(1) $f(x) = [x]$ for $x \in [5, 9]$

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

* Verify mean value theorem, if $f(x) = x^3 - 5x^2 - 3x$ in the interval $[a, b]$ where $a=1$ and $b=3$, Find all $c \in (1, 3)$ for which $f'(c) = 0$.