

Continuity and Differentiability Assignment

QUESTION1:

Check the continuity of the function f given by $f(x) = 7x + 5$ at $x = 1$.

QUESTION2:

For what value of k is the following function continuous at $x = 1$

$$f(x) = \begin{cases} \frac{x^2 - 1}{x - 1}, & x \neq 1 \\ 4k, & x = 1 \end{cases}$$

QUESTION3: Show that a cosine function is a continuous function

QUESTION 4: Find two points at which the given function $y = |x-2| + |x-5|$ is continuous but not differentiable.

QUESTION 5:

Use Mathematical Induction to prove that $\frac{d}{dx}(x^n) = nx^{n-1}$, where n is a natural number

QUESTION 6: Differentiate $(9x^2 - 9x + 5)^8$

QUESTION 7: Differentiate $(\sin^9 x + \cos^6 x)$

QUESTION 8: Find $\frac{d}{dx}[\cos(-2 \cos x + 3 \sin x)]$

QUESTION 9:

Using the fact that $\sin(A - B) = \sin A \cos B - \cos A \sin B$ and the differentiation, obtain the difference formula for cosines.

QUESTION 10: Differentiate $(7x)^{3 \cos 2x}$

QUESTION 11: Differentiate $[\sin^{-1} x \sqrt{x}]$; $0 \leq x \leq 1$

QUESTION 12: Differentiate $\frac{\cos^{-1} \frac{2x}{3}}{\sqrt{4x+7}}$

QUESTION 13: Find $\frac{dy}{dx}$ if $y = \sin^{-1} x - \sin^{-1} \sqrt{1-x^2}$ when $0 < x < 1$

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QUESTION 14: Find $\frac{dy}{dx}$, if $y = (\log 5x)^{\log 5x}$, $x > 1$

QUESTION 15: Find the derivative of $y = (\sin x + \cos x)^{\sin x + \cos x}$; $0 < x < 2\pi$

QUESTION 16:

Find $\frac{d}{dx}\{x^x + x^4 + 4^x + 4^4\}$ at $x = 3$

QUESTION 17:

Find $\frac{d}{dx}[x^{x^2-3} + (x-3)^{x^2}]$ for $x = 5$

QUESTION 18:

Find $\frac{dy}{dx}$, if $\cos y = x \cos(20 + y)$

QUESTION 19:

Find $\frac{dy}{dx}$ if $y = 10(1 - \cos t)$; $x = 15(t - \sin t)$; $-\frac{\pi}{2} < t < \frac{\pi}{2}$

QUESTION 20:

Find $\frac{d^2y}{dx^2}$; $x = 20(\cos t + t \sin t)$ and $y = 20(\sin t - t \cos t)$

QUESTION 21:

Find $f''(x)$ for $f(x) = |7x|^3$ such that $x \in \mathbb{R}$ and $x < 0$