MATHS

BOOKS - RESONANCE DPP ENGLISH

CONTINUITY AND DIFFERENTIABILITY

Others

1. Let f (x) be a polynomial in x. The second derivative of $f(e^x)$ w.r.t. x is :

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2. Find the values of a and b if f is continuous at x=0, where

$$f(x)=\begin{cases}(\sin x+\cos x)^{\cos ecx} & -\frac{\pi}{2}<x<0\\ a & x=0\\ \frac{e^{1/x}+e(2/x)+e^{3/x}}{ae^{-2+1/x}+be^{-1+3/x}} & 0<x<\frac{\pi}{2}\end{cases}$$

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3. Let g be the inverse function of f and $f'(x) = \frac{x^{10}}{1+x^2}$. If $f(2) = a$ then $g'(2)$ is equal to

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4. Differentiate $\tan^{-1}\left(\frac{1+2x}{1-2x}\right) w.r.t. \sqrt{1+4x^2}$

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5. Find $\frac{dy}{dx} : x = a\left\{\cos t + \frac{1}{2}\log tan^2\frac{t}{2}\right\}$ and $y = a\sin t$.

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6. Differentiate the given functions w.r.t.x.

$(i) y = (\ln x)^{\cos x}$

(ii) $y = x^x - 2^{\sin x}$

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7. Differentiate the following functions with respect to x

(i) $x^{\frac{2}{3}} + 7e - \frac{5}{x} + 7\tan x$

(ii) $x^2 \ln x e^x$

(iii) $\ln \tan\left(\frac{\pi}{4} + \frac{x}{2}\right)$

(iv) $\frac{\sin x - x\cos x}{x\sin x + \cos x}$

(v) $\tan\left(\tan^{-1}\sqrt{\frac{1-\cos x}{1+\cos x}}\right), 0 < x < \pi$

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8. If $y = \sec\left(\tan^{-1} x\right)$, then $\frac{dy}{dx}$ at $x = 1$ is equal to

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9. $y = \tan^{-1}\frac{4x}{1+5x^2} + \tan^{-1}\frac{2+3x}{3-2x}$

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10. If $f'(x) = \sqrt{2x^2 - 1}$ and $y = f(x^2)$, then find $\frac{dy}{dx}$ at $x = 1$.

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11. Find $\frac{dy}{dx}$, when $xandy$ are connected by the following relations $(i)ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0\,(ii)xy + xe^{-y} + ye^{x} = x^2$

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12. Let : $f(x) = \begin{cases} \frac{\sin ax^2}{x^2}, x \neq 0 \\ \frac{3}{4} + \frac{1}{4a}, x = 0 \end{cases}$ for what values of a is $f(x)$ continuous at $x = 0$?

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13. If $y = Ae^{-kt}\cos(pt + c)$, then prove that $\frac{d^2y}{dt^2} + 2k\frac{dy}{dx} + n^2y = 0$, where $n^2 = p^2 + k^2$

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14. $\frac{d^2x}{dy^2}$ equals: $\left(\frac{d^2y}{dx^2}\right)^{-1}$ (b) $-\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-2}$ (d) $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$

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15. If $x = at^2, y = 2at$, then $\frac{d^2y}{dx^2}$ is equal to (a) $-\frac{1}{t^2}$ (b) $\frac{1}{2at^2}$ (c) $-\frac{1}{t^3}$ (d) $\frac{1}{2at^3}$

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16. If $x = \frac{1+t}{t^3}, y = \frac{3}{2t^2} + \frac{2}{t}$, then $x\left(\frac{dy}{dx}\right)^3 - \frac{dy}{dx}$ is equal to (a)0 (b) -1 (c)1(d)2

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17. If $e^y(x+1) = 1$, show that $\frac{d^{2y}}{dx^2} = \left(\frac{dy}{dx}\right)^2$ If $y = \sin\left(2\sin^{-1}x\right)$, show that $\frac{\left(1-x^2\right)d^{2y}}{dx^2} = x\frac{dy}{dx} - 4y$

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18. Evaluate : $(\lim)_{x \overrightarrow{2} a^+} \frac{\sqrt{x-2a} + \sqrt{x} - \sqrt{2a}}{\sqrt{x^2-4a^2}}$

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19. Evaluate: $\lim_{x \to 0^+} \left(\frac{e^{x\ln\left(2^x-1\right)} - \left(2^x-1\right)^x \sin x}{e^{x\ln x}}\right)^{\frac{1}{x}}$

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20. Let $f(x) = \left[\frac{\sin x}{x}\right] + \left[\frac{2\sin 2x}{x}\right] + + \left[\frac{10\sin 10x}{x}\right]$ (where [.] is the greatest integer function) Then the value of $(\lim)_{x\ 0} \underset{\rightarrow}{} f(x)$ equals 55

(b) 164 (c) 165 (d) 375

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21. The sum of the series $\frac{x}{1!} + \frac{2x^2}{2!} + \frac{3x^3}{3!} +$ is xe^x b. $-xe^x$ c.$xe^x - x$

d. $xe^x + x$

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22. If $ax^2 + 2hxy + by^2 = 0,$ then $\frac{dy}{dx}$ is equal to $\frac{y}{x}$ (b) $\frac{x}{y}$ (c) (d) None of these

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23. If $f(x) = (\log)_x(\ln x), then f'(x)$ at $x = e$ is equal to $\frac{1}{e}$ (b) e (c) 1 (d) zero

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24. Let $y = x^3 - 8x + 7$ and $x = f(t)$. If $\frac{dy}{dt} = 2$ and $x = 3att = 0$, then $\frac{d}{d}$ at t = 0 is given by

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25. If $x = \frac{1+t}{t^3}, y = \frac{3}{2t^2} + \frac{2}{t}$ satisfy $f(x)\left(\frac{dy}{dx}\right)^3 = 1 + \frac{dy}{dx}$, then f(x) equals

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26. $Let f(x) = \begin{cases} \frac{x-4}{|x-4|} + a & x < 4 \\ a + b & x = 4 \\ \frac{x-4}{|x-4|} + b & x > 4 \end{cases}$

then f(x) is continuous at x=4 when

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27. The point(s) of minimum of function, $f(x) = 4x^3 - x|x-2|, x \in [0, 3]$ is $x = 0$ (b) $x = \frac{1}{3}$ $x = \frac{1}{2}$ (d) $x = 2$

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28. Let $g(x) = \log_e f(x)$ where $f(x)$ is twice differentiable positive function on $(0, \infty)$ such that $f(x+1) = f(x)$, for $N = 1, 2, 3, \ldots,$ then $g''\left(N + \frac{1}{2}\right) - g''\left(\frac{1}{2}\right) equals$

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29. Let $f:(1,1)\overrightarrow{R}$ be a differentiable function with $f(0)=-1 and f'(0)=1$. Let $g(x)=[f(2f(x)+2)]^2$. Then $g'(0)=$

(1) 4 (2) 0 (3) 2 (4) 4

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30. If $y=\left(\sin^{-1}x\right)^2+\left(\cos^{-1}x\right)^2$, then $\left(1-x^2\right)\frac{d^2y}{dx^2}-x\frac{dy}{dx}$ is equal to 4 (b) 3 (c) 1 (d) 0

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31. Statement-1 Let $f:[0,\infty)\overrightarrow{0,\infty}$ be a function defined by $y=f(x)=x^2$, then $\left(\frac{d^2y}{dx^2}\right)\left(\frac{d^2x}{dy^2}\right)=1$ Statement-2 $\frac{d^2y}{dx^2}=-\frac{d^2x}{dy^2}\left(\frac{dy}{dx}\right)^3$ Statement-1 is True, Statement-2 is True and Statement-2 is correct explanation for Statement-1 Statement-1 is True, Statement-2 is True and Statement-2 is not correct explanation for

Statement-1 Statement-1 is True, Statement-2 is false Statement-2 is False, Statement-2 is true Both Statements are false

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32. If $f(x), g(x) and h(x)$ are three polynomial of degree 2, then prove that $\phi(x) = \left| f(x)g(x)h(x)f'(x)g'(xh'(x)f''(x)g''(x)h''(x) \right|$ is:

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33. Let $f(x)$ be a polynomial.Then, the second order derivative of $f(e^x)$ is

$f^{e^x}e^{2x} + f'(e^x)e^x\ f^{e^x}e^x + f'(e^x)\ f^{e^x}e^{2x} + f^{e^x}e^x$ (d) f^{e^x}

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34. about to only mathematics

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35. If the function $f(x) = \frac{x^2}{2} + \ln x + ax$ is always monotonically increasing in its domain then the least value of a is 2 (b) -2 (c) -1 (d) 1

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36. $f_n(x) = e^{f_{n-1}(x)}$ for all $n \in N and f_0(x) = x, then \frac{d}{dx}\{f_n(x)\}$ is $\frac{f_n(x)d}{dx}\{f_{n-1}(x)\}$ (b) $f_n(x)f_{n-1}(x)$ $f_n(x)f_{n-1}(x)f_2(x)\dot{f}_1(x)$ $none of these$

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37. $\frac{d^2x}{dy^2}$ equals: $\left(\frac{d^2y}{dx^2}\right)^{-1}$ (b) $-\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-2}$ (d) $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$

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38. $y = \tan^{-1}\frac{4x}{1+5x^2} + \tan^{-1}\frac{2+3x}{3-2x}$

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39. If $f(x) = \lim_{x \to \infty} x\left(\frac{3}{2} + [\cos x)\left(\sqrt{n^2+1} - \sqrt{n^2-3n+1}\right)\right)$ where [y] denotes largest integer $\leq y$, then identify the correct statement (s).

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40. If $g(x) = \frac{2h(x) + |h(x)|}{2h(x) - |h(x)|}$ where $h(x) = \sin x - \sin^n x, n \in R^+$, the set of positive real numbers, and $f(x) = \left\{[g(x)], x\left(0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right) \text{ and } 3, x = \frac{\pi}{2}\right.$ where [.] denotes greatest integer function. Then (a)$f(x)$ is continuous and differentiable at $x = \frac{\pi}{2}$, when $0 < n < 1$ (b)$f(x)$ is continuous and differentiable at $x = \frac{\pi}{2}$, when $n > 1$ (c)$f(x)$ is discontinuous and non differentiable at $x = \frac{\pi}{2}, f$ or $0 < n < 1$ (d)$f(x)$ is continuous but not differentiable at $x = \frac{\pi}{2}$, when $n > 1$

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41. If

$f(x) = \left|\cos\left(x + x^2\right)\sin\left(x + x^2\right) - \cos\left(x + x^2\right)\sin\left(x - x^2\right)\cos\left(x - x^2\right)\sin\right.$

$f(-2) = 0$ (b) $f'\left(-\frac{1}{2}\right) = 0$ $f'(-1) = -2$ (d) $f^0 = 4$

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42. If If

$$y = \cfrac{x}{a + \cfrac{x}{b + \cfrac{x}{a + \cfrac{x}{b + \ldots\infty}}}}$$

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43. Find the sum of the series $1 + 2x + 3x^2 + (n-1)x^{n-2}$ using differentiation.

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44. If $y = a^x \hat{} a^x \hat{} \ldots^{((((\infty))))}$, then prove that $\frac{dy}{dx} = \frac{y^2(\log)_e y}{x\left(1 - y(\log)_e x(\log)_e y\right)}$

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45. Let `f(x)={s in2x ,0

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46. If f is twice differentiable such that $f''(x) = -f(x)$, $f'(x) = g(x)$, $h'(x) = [f(x)]^2 + [g(x)]^2$ and $h(0) = 2$, $h(1) = 4$, then the equation $y = h(x)$ represents.

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47. Find $\frac{dy}{dx} : x = a\left\{\cos t + \frac{1}{2}\log tan^2\frac{t}{2}\right\}$ and $y = a\sin t$.

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48. If $x^m y^n = (x+y)^{m+n}$, prove that $\frac{dy}{dx} = \frac{y}{x}$.

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49. If $e^{f(x)} = \log x$ and g(x) is the inverse function of f(x), then $g'(x)$ is

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50. If $y = \sec\left(\tan^{-1} x\right)$, then $\frac{dy}{dx}$ at $x = 1$ is equal to

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51. If $8f(x) + 6f\left(\frac{1}{x}\right) = x + 5$ and $y = x^2(f(x)$, then $\frac{dy}{dx}$ at $x = -1$ is equal to (a)0 (b) $\frac{1}{14}$ (c) $-\frac{1}{4}$ (d) None of these

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52. If $f(x) = 2\ln(x-2) - x^2 + 4x + 1$, then find the solution set of the inequality $f'(x) \geq 0$

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53. Differentiate the given functions w.r.t.x. $(\ln x)^{\cos x}$,

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