MATHS

BOOKS - HIMALAYA MATHS (KANNADA ENGLISH)

LIMITS, CONTINUITY AND DIFFERENTIABILITY

Question Bank

1. $\lim_{x \to 3} \frac{(x-3)(x^2-2)}{x^2-2x-3} =$

A. (3/2)

B. (7/2)

C. (7/4)

D. (-7/4)

Answer: C

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2. $\lim_{x \to 1} \frac{x^{18} - 1}{x^6 - 1} =$

A. 0

B. (1/3)

C. 3

D. none of these

Answer: C

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3. $\lim_{x \to -1} \frac{x^2 + 3x + 2}{x^2 + 4x + 3} =$

A. 0

B. (1/2)

C. 2

D. (-1)

Answer: B

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4. $\lim_{x \to 4} \frac{x^{\frac{3}{2}} - 8}{x - 4} =$

A. (3/2)

B. 3

C. (2/3)

D. (1/3)

Answer: B

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5. $\lim_{x \to 0} \frac{\sqrt{2+x^3} - \sqrt{2-x^3}}{x^3} =$

A. $\sqrt{2}$

B. $\frac{1}{\sqrt{2}}$

C. $-\frac{1}{\sqrt{2}}$

D. $\sqrt{3}$

Answer: B

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6. $\lim_{x \to 0} \left(\sqrt{1+x} - \frac{\sqrt{1-x}}{x} \right) =$

A. 1

B. 2

C. 0

D. (1/2)

Answer: D

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7. $\lim_{x \to 0} \frac{\sqrt{1+x}-1}{x} =$

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8. $\lim_{x \to 0} \frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{x} =$

A. 0

B. (1/2)

C. 2

D. none of these

Answer: A

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9. $\lim_{x \to 0} \frac{\sqrt{9+x} - \sqrt{9-x}}{x} =$

A. 3

B. (1/9)

C. (1/3)

D. 9

Answer: C

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10. $\lim_{x \to 0} \frac{x}{\sqrt{4-x} - \sqrt{4+x}} =$

A. 2

B. (-2)

C. (1/2)

D. (-1/2)

Answer: B

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11. $\lim_{x \to 0} \frac{\sqrt{3+x} - \sqrt{3-x}}{x} =$

A. $\frac{1}{\sqrt{3}}$

B. (1/3)

C. (2/3)

D. 1

Answer: A

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12. $\lim_{x \to 2} \frac{x^5\sqrt{x} - 32\sqrt{2}}{x^3\sqrt{x} - 8\sqrt{2}} =$

A. (22/7)

B. (41/7)

C. (44/7)

D. (48/7)

Answer: C

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13. $\lim_{h \to 0} \frac{\sin\sqrt{x+h} - \sin\sqrt{x}}{h} =$

A. $\frac{\cos\sqrt{x}}{2\sqrt{x}}$

B. $\sin\sqrt{x}$

C. $\cos\sqrt{x}$

D. $\frac{1}{2\sin\sqrt{x}}$

Answer: A

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14. $\lim_{x \to \tan^{-1}} \frac{\tan^2 x - 2\tan x - 3}{\tan^2 x - 4\tan x + 3} =$

A. 2

B. (1/2)

C. 0

D. 1

Answer: A

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15. $\lim_{x \to \frac{\pi}{3}} \frac{\sin\left(\frac{\pi}{3} - x\right)}{2\cos x - 1} =$

A. $\frac{2}{\sqrt{3}}$

B. $\frac{1}{\sqrt{3}}$

C. $\sqrt{3}$

D. (1/2)

Answer: B

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16. $\lim_{x \to 1} \frac{\log_e x}{x - 1}$ equals :

A. 0

B. 1

C. 2

D. (1/2)

Answer: B

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17. $\lim_{\theta \to 0} \frac{\sin 3\theta . \sin 4\theta}{\theta . \sin 5\theta} =$

A. (5/12)

B. (12/5)

C. (1/2)

D. (1/6)

Answer: B

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18. $\lim_{x \to 0} \frac{\sin^3 2x . \tan^3 3x}{x . \left(\sin^{-1} 4x\right)^4} =$

A. (3/4)

B. 2

C. (1/32)

D. (9/32)

Answer: D

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19. $\lim_{x \to 0} \frac{1 - \cos nx}{x . (1 - \cos mx)} =$

A. (m/n)

B. (n/m)

C. $\frac{m^2}{n^2}$

D. $\frac{n^2}{m^2}$

Answer: D

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20. $\lim_{x \to 0} \frac{\tan mx}{\tan nx} =$

A. m/n

B. $\frac{m^2}{n^2}$

C. (n/m)

D. $\frac{n^2}{m^2}$

Answer: A

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21. $\lim_{x \to 0} \frac{\left(\sin^{-1} 3x\right)^3 . \tan x}{\left(\tan^{-1} x\right)^2 . x^2} =$

A. 9

B. 18

C. 27

D. 54

Answer: C

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22. $\lim_{x \to 0} \frac{\tan^{-1} 3x - 4 \tan x}{4 \sin^{-1} 2x - 7x} =$

A. 1

B. (-1)

C. (1/2)

D. (7/4)

Answer: B

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23. $\lim_{x \to 0} \frac{\tan^{-1} 7x}{\sin 4x} =$

A. (4/7)

B. (3/5)

C. (7/4)

D. (21/8)

Answer: C

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24. $\lim_{x \to 0} \left(\frac{\sin(4x)}{5x} \right) =$

A. (4/5)

B. 1

C. 0

D. (5/4)

Answer: A

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25. $\lim_{x \to 0} \frac{\sin^2\left(\frac{x}{4}\right)}{x^2} =$

A. 4

B. (1/4)

C. 16

D. (1/16)

Answer: D

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26. $\lim_{x \to 0} \frac{1 - \cos 4x}{x2} =$

A. (7/9)

B. (9/7)

C. 49/81

D. 81/49

Answer: C

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27. $\lim_{x \to 0} \frac{1 - \cos 4x}{x2} =$

A. 0

B. 1

C. 4

D. 8

Answer: A

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28. $\lim_{x \to 0} \frac{1 - \cos 5x}{\sin 4x} =$

A. (5/4)

B. (4/5)

C. 0

D. (-5/4)

Answer: C

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29. $\lim_{x \to 0} \frac{1 - \cos 5x}{\sin^{-1} 2x} =$

A. (5/2)

B. (-5/2)

C. 0

D. 1

Answer: C

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30. $\lim_{x \to 0} \frac{1 - \cos 5x}{\sin 3x . \tan 2x} =$

A. A. (25/12)

B. B. (5/6)

C. C. (5/3)

D. D. (5/2)

Answer: A

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31. $\lim_{x \to 0} \frac{1 - \cos\left(\frac{x}{3}\right)}{x^2} =$

A. A. 18

B. B. (1/9)

C. C. 9

D. D. (1/18)

Answer: D

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32. $\lim_{x \to 0} \frac{1 - \cos(4x)^3}{5x.\tan(2x)} =$

A. A. (3/10)

B. B. (9/10)

C. C. (12/5)

D. D. (5/12)

Answer: C

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33. $\lim_{\theta \to 0} \frac{\cos 5\theta - \cos 7\theta}{\theta^2} =$

A. A. (1/6)

B. B. (1/12)

C. C. 12

D. D. 6

Answer: C

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34. $\lim_{x \to 0} \frac{\cos 2x - \cos 7x}{\sin 3x . \tan 5x} =$

A. (-1/3)

B. (9/8)

C. (9/2)

D. (3/2)

Answer: D

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35. $\lim_{x \to 0} \frac{\cos 9x - \cos 7x}{x^2} =$

A. 16

B. (-16)

C. 9

D. 7

Answer: B

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36. $\lim_{x \to 0} \frac{\cos^3 2x - \cos^3 3x}{x^2} =$

A. (15/2)

B. (1/2)

C. (6/5)

D. 0

Answer: A

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37. $\lim_{x \to 0} \frac{\tan x - \sin x}{x^3} =$

A. 1

B. (1/2)

C. (1/3)

D. 0

Answer: B

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38. $\lim_{x \to 0} \frac{\tan^3 2x - \sin^3 2x}{x^5} =$

A. 8

B. 45

C. 48

D. none of these

Answer: C

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39. $\lim_{\theta \to 0} \frac{1 - \cos\theta}{\theta \sin\theta} =$

A. (1/2)

B. 2

C. $\sqrt{2}$

D. 0

Answer: A

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40. $\lim_{x \to \frac{\pi}{2}} (\sec x - \tan x) =$

A. (-2)

B. (-1)

C. 0

D. 1

Answer: C

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41. $\lim_{\alpha \to \beta} \frac{\sin^2 \alpha - \sin^2 \beta}{\alpha^2 - \beta^2} =$

A. 0

B. 1

C. $\frac{\sin \beta}{\beta}$

D. $\frac{\sin 2\beta}{\beta}$

Answer: D

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42. $\lim_{\theta \to 0} \frac{\sin 5\theta - \sin 3\theta}{\theta} =$

A. 2

B. 1

C. (1/2)

D. none of these

Answer: A

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43. $\lim_{\theta \to 0} \frac{\tan \theta - \sin \theta}{\theta^3} =$

A. 0

B. 2

C. (1/2)

D. (1/3)

Answer: C

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44. $\lim_{x \to 0} \frac{e^{x^2} - \cos x}{x^2} =$

A. (3/2)

B. (1/2)

C. (2/3)

D. 2

Answer: A

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45. $\lim_{x \to 0} \frac{\log(1+x)}{3^x - 1} =$

A. $\log_e 3$

B. 0

C. 1

D. $\log_3 e$

Answer: D

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46. $\lim_{x \to 0} \frac{e^x + e^{-x} - 2}{x^2} =$

A. 1

B. (-1)

C. (1/2)

D. (-1/2)

Answer: A

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47. $\lim_{x \to 0} \frac{\sin x^o}{x} =$

A. 1

B. π

C. $\frac{\pi}{180}$

D. $\frac{180}{\pi}$

Answer: C

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48. $\lim_{\theta \to \frac{\pi}{2}} \frac{1 - \sin\theta}{\left(\frac{\pi}{2} - \theta\right)\cos\theta} =$

A. 1

B. (-1)

C. (-1/2)

D. (1/2)

Answer: D

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49. $\lim_{x \to \infty} \frac{(x-2)(x+4)}{x(x-9)} =$

A. 0

B. (1/2)

C. (1/3)

D. 1

Answer: D

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50. $\lim_{x \to \infty} \frac{2x^2 - x - 1}{x^2 + x - 2} =$

A. (1/2)

B. 1

C. 0

D. 2

Answer: D

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51. $\lim_{x \to \infty} \frac{(2n+1)(3n+2)}{n(n+9)} =$

A. (2/9)

B. 6

C. 3

D. (2/3)

Answer: B

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52. $\lim_{x \to \infty} \frac{(x+1)(x+2)}{x^2(x+3)} =$

A. 0

B. 2

C. (1/2)

D. 1

Answer: A

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53. $\lim_{n \to \infty} \frac{1 + 2 + 3 + ... + n}{n^2 + 1} =$

A. 1

B. 2

C. (1/2)

D. none of these

Answer: C

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54. $\lim_{n \to \infty} \frac{1^3 + 2^3 + ... + n^3}{3n^4 + 5n^3 + 6} =$

A. (1/3)

B. (1/5)

C. (1/6)

D. (1/12)

Answer: D

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55. $\lim_{n \to \infty} \frac{1 - n^2}{\sum n} =$

A. (-2)

B. (-1)

C. 2

D. 1

Answer: A

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56. Let $a = \lim_{n \to \infty} \frac{1 + 2 + 3 + \ldots . + n}{n^2} =$, b = $\lim_{n \to \infty} \frac{1^2 + 2^2 + \ldots . + n^2}{n^3} =$ then

A. a = b

B. $a < b$

C. 2a = 3b

D. a = 2b

Answer: C

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57. $\lim_{n \to \infty} \frac{1.2 + 2.3 + 3.4 + \ldots . + n(n+1)}{n^3} =$

A. 1

B. (-1)

C. (1/3)

D. (1/6)

Answer: C

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58. $\lim_{x \to \infty} \left\{ \sqrt{x^2 + 5x - 7} - x \right\} =$

A. 2

B. (3/2)

C. (5/2)

D. (7/2)

Answer: C

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59. $\lim_{n \to \infty} n\left(\sqrt{n^2+8}-n\right) =$

A. 2

B. 4

C. 6

D. 8

Answer: B

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60. $\lim_{n \to \infty} \left(n\sqrt{n^2+1} - n\right) =$

A. (1/2)

B. $\frac{1}{\sqrt{2}}$

C. $\sqrt{2}$

D. 0

Answer: A

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61. $\lim_{n \to \infty} n\left(\sqrt{n^2+6} - n\right) =$

A. 3

B. 4

C. (-6)

D. (-3)

Answer: A

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62. $\lim_{n \to \infty} (4^n + 5^n)^{\frac{1}{n}} =$

A. 4

B. 5

C. e

D. e^{-1}

Answer: B

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63. The value of $\lim_{x \to 0} \left(\frac{e^x - 1}{x} \right)$

A. 0

B. 1

C. $\in$

D. (1/2)

Answer: B

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64. $\lim_{x \to \infty} \left(\frac{x + 6}{x + 1} \right)^{x+4} =$

A. e^{-5}

B. e^5

C. 0

D. none of these

Answer: B

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65. $\lim_{x \to 0} \frac{e^x - (1+x)}{x^2} =$

A. 0

B. (1/4)

C. (1/2)

D. 1

Answer: C

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66. $\lim_{x \to 0} \frac{\tan\left(\sin^{-1} 3x\right)}{\sin^{-1}(2\tan x)} =$

A. (3/4)

B. (4/3)

C. (3/2)

D. (2/3)

Answer: C

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67. If $g(x) = -\sqrt{25 - x^2}$ the $\lim_{x \to 1} \frac{g(x) - g(1)}{x - 1} =$

A. $\frac{3}{\sqrt{24}}$

B. $\frac{1}{\sqrt{24}}$

C. $-\frac{1}{\sqrt{24}}$

D. $-\frac{3}{\sqrt{24}}$

Answer: B

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68. $f(x) = \cot^{-1}\left(\frac{3x - x^3}{1 - 3x^2}\right)$ and $f(x) = \sin^{-1}\left(\frac{1 - x^2}{1 + x^2}\right)$ then $\lim_{x \to t} \frac{f(x) - f(t)}{g(x) - g(t)} =$

A. $\frac{3}{2(1 + t^2)}$

B. (-3/2)

C. (3/2)

D. $\frac{-3}{2(1 + t^2)}$

Answer: C

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69. Let $f(x) = \sin^{-1}(1 - 2x^2)$ and $g(x) = \cos^{-1}(4x^3 - 3x)$ then $\lim_{x \to a} \frac{f(x) - f(a)}{g(x) - g(a)} =$

A. (2/3)

B. $\frac{3}{2\sqrt{1 - a^2}}$

C. $-\frac{2}{3\sqrt{1 - a^2}}$

D. (-2/3)

Answer: A

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70. $\lim_{x \to a} \left(\frac{\cos x - \cos a}{\cot x - \cot a} \right) =$

A. $\frac{1}{2}\sin^3 a$

B. $\frac{1}{2}\cos ec^3 a$

C. $\sin^3 a$

D. $\cos ec^3 a$

Answer: C

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71. If f(2) = 2 and $f'(2) = 1$, then $\lim_{x \to 2} \frac{2x^2 - 4f(x)}{x - 2} =$

A. 4

B. (-4)

C. 2

D. (-2)

Answer: A

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72. If f(5) = 7 and $f'(5) = 7$ then lim_(x rarr 5) (x f(5) - 5 f(x))/(x-5)`

A. 28

B. 35

C. (-28)

D. (-35)

Answer: C

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73. $\lim_{h \to 0} \frac{\sqrt{x+h} - \sqrt{x}}{h} =$

A. $\sqrt{x}$

B. $\frac{1}{\sqrt{x}}$

C. $2\sqrt{x}$

D. $\frac{1}{2\sqrt{x}}$

Answer: D

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74. $\lim_{n \to \infty} (4^n + 5^n)^{\frac{1}{n}} =$

A. 4

B. 5

C. e

D. 3

Answer: B

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75. $\lim_{n \to \infty} 5^{\left(\frac{2x}{x+3}\right)} =$

A. 5

B. 25

C. 15

D. 1

Answer: B

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76. $\lim_{x \to \infty} \left(1 - \frac{2}{x}\right)^{x} =$

A. e^{2}

B. e^{-2}

C. 0

D. ∞

Answer: B

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77. $\lim_{n \to \infty} \frac{\sin n\theta}{\sqrt{n}} =$

A. 1

B. 0

C. (-1)

D. does not exist

Answer: B

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78. $\lim_{x \to \infty} \left(\frac{x}{1+x} \right)^x =$

A. e

B. 1

C. 1/e

D. (-1)

Answer: C

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79. $\lim_{x \to 0} \frac{a^x - 1}{\sqrt{1+x} - 1} =$

A. 2 log a

B. 1/2 log a

C. a log 2

D. 1/a log 2

Answer: A

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80. If a,b, c, d are positive, then $\lim_{x \to \infty} \left(1 + \frac{1}{a + bx}\right)^{c + dx} =$

A. e

B. $c^{\frac{(c+d)}{(a+b)}}$

C. $e^{\frac{d}{b}}$

D. $e^{\frac{c}{a}}$

Answer: C

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81. $\lim_{x \to 0} \left(\frac{1 + \tan x}{1 + \sin x} \right)^{\cos ecx} =$

A. e

B. e^{-1}

C. 1

D. e^2

Answer: C

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82. $\lim_{x \to 00} \frac{(2 + x)^{30}(4 + x)^7}{(2 - x)^{37}} =$

A. 1

B. (1/2)

C. (-1)

D. 5

Answer: C

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83. $\lim_{x \to 0} \left[\frac{10^x - 2^x - 5^x + 1}{x . \tan x} \right] =$

A. log 2

B. (log 2).(log 5)

C. (log 2)/(log 5)

D. log 10

Answer: B

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84. $\lim_{n \to \infty} \frac{3.2^{n+1} - 4.5^{n+1}}{5.2^n + 7.5^n} =$

A. (20/7)

B. (-20/7)

C. (7/20)

D. (-7/20)

Answer: B

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85. If $\lim_{x \to 0} (1 + px)^{\frac{q}{x}} = e^4, where$p,q in N`, then

A. p =4,q=2

B. p = 8, q=4

C. p = 16, q = 8

D. p = 4, q = 1

Answer: D

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86. $\lim_{x \to 0} \frac{\sin x + \log(1 - x)}{x^2} =$

A. 0

B. (1/2)

C. (-1/2)

D. 1

Answer: C

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87. Let `f(x) = {(1+x, x gt 0),(x, x le 0):} . Lim_(x rarr 0) f(x) =

A. is 1

B. is 0

C. is -1

D. does not exist

Answer: D

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88. $\lim_{h \to 0} \frac{\sqrt{x+h} - \sqrt{x}}{h} =$

A. $\sqrt{x}$

B. $\frac{1}{\sqrt{x}}$

C. $\frac{1}{2\sqrt{x}}$

D. $2\sqrt{x}$

Answer: C

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89. The values of a and b so that $\lim_{x \to \infty} \left[\frac{x^2+1}{x+1} - ax - b \right] = 0$ is

A. a =0, b = 0

B. a = 1, b = -1

C. a = -1, b =1

D. a = 2, b =-1

Answer: B

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90. $\lim_{x \to 2} \frac{\sqrt{x-2}+\sqrt{x}-\sqrt{2}}{\sqrt{x^2-4}} =$

A. (1/2)

B. 1

C. 2

D. none

Answer: A

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91. $\lim_{x \to \pi/3} \frac{2\sin(x-\pi/3)}{1-2\cos x}$ equals :

A. $\frac{2}{\sqrt{3}}$

B. $\frac{1}{\sqrt{2}}$

C. (1/3)

D. (2/3)

Answer: A

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92. Let $f(x) = 4x^9 - 3x^8 + 2x^7 + x^3 + x^2 - 4$, then $\lim_{h \to 0} \frac{f(1-h) - f(1)}{h^3 + 3h} =$

A. (31/3)

B. (3/31)

C. (-31/3)

D. (-3/31)

Answer: C

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93. Let $f(x) = \begin{cases} x\left(\sin 1/x + \sin\left(1/x^2\right)\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$ Then $\lim_{x \to \infty} f(x)$ equals :

A. (-1)

B. 1

C. (1/2)

D. (-1/2)

Answer: B

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94. If $\lim_{x \to -a} \frac{x^9 + a^9}{x + a} = 9$, then a =

A. (-7)

B. (-1)

C. 7

D. 1

Answer: B

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95. $\lim_{x \to \infty} \left[\sqrt{x + \sqrt{x + \sqrt{x - \sqrt{x}}}} \right] =$

A. (1/2)

B. 1

C. (1/3)

D. (-1)

Answer: A

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96. $\lim_{x \to 1} \frac{\log_e x}{x - 1}$ equals :

A. (1/2)

B. (-1)

C. 1

D. 0

Answer: C

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97. If f be a function such that f(9) = 9 and f'(9) = 3, then :

$\lim_{x \to 9} \frac{\sqrt{f(x)} - 3}{\sqrt{x} - 3}$ is :

A. 1

B. 9

C. 3

D. 6

Answer: C

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98. $\lim_{x \to 0} \left(\frac{1^x + 2^x + 3^x + \ldots\ldots\ldots + n^x}{n} \right)^{\frac{1}{x}} =$

A. $(n!)^n$

B. $(n!)^{\frac{1}{n}}$

C. n!

D. log (n!)

Answer: B

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99. If $f(x) = \frac{\sin\left(e^{x-2}-1\right)}{\log(x-1)}$, then $\lim_{x \to 2} f(x)$ is given by :

A. (-2)

B. (-1)

C. 0

D. 1

Answer: D

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100. $\lim_{x \to 0} \left(\frac{\tan x - x}{x}\right).(\sin)\frac{1}{x} =$

A. a real number other than 0 and 1

B. 0

C. 1

D. (1/2)

Answer: B

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101. If $\lim_{x \to 0} \frac{x(1 + m\cos x) - n(\sin x)}{x^3} = 1$ then

A. m =-5/2, n = 3/2

B. m = -5/2, n =-3/2

C. m = 3/2, n = 5/2

D. m = 3/2m n = -5/2

Answer: B

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102. $\lim_{x \to 0} (\cos x + a \sin bx)^{\frac{1}{x}} =$

A. $e^{\frac{a}{b}}$

B. $e^{\frac{b}{a}}$

C. e^(ab)`

D. e^{a+b}

Answer: C

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103. $\lim_{x \to a} \frac{x^{\frac{7}{6}} - a^{\frac{7}{6}}}{x^{\frac{3}{5}} - a^{\frac{3}{5}}}, (a > 0) =$

A. (-2a)

B. $2a^3$

C. 0

D. $\frac{35}{18}a^{\frac{17}{30}}$

Answer: D

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104. $\lim_{n\to\infty}\left[\frac{1}{1-n^4}+\frac{8}{1-n^4}+\ldots.+\frac{n^3}{1-n^4}\right]=$

A. (1/8)

B. (-1/4)

C. (1/4)

D. (-1/8)

Answer: B

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105. $\lim_{n \to \infty} \left[\frac{2}{3} + \left(\frac{2}{3} \right)^2 + \left(\frac{2}{3} \right)^2 + \ldots . + \left(\frac{2}{3} \right)^n \right] =$

A. 1

B. 2

C. (1/2)

D. (-1)

Answer: B

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106. $\lim_{n \to \infty} \frac{1}{n^3} \sum_{r=1}^{n} r^2$ is :

A. (1/3)

B. (1/2)

C. (1/4)

D. (1/5)

Answer: A

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107. $\lim_{x \to \infty} \frac{1}{n^4} \sum_{r=1}^{n} r^3$ is :

A. (1/4)

B. (1/3)

C. (1/2)

D. 1

Answer: A

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108. $\lim_{n \to \infty} \left(\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots . + \frac{1}{n(n+1)} \right)$ is :

A. (1/3)

B. (2/3)

C. 0

D. 1

Answer: D

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109. $\lim_{n \to \infty} \frac{1}{n^3} \left\{ 1 + 3 + 6 + \ldots + \frac{n(n+1)}{2} \right\} =$

A. (-1/6)

B. (1/5)

C. (1/6)

D. (1/4)

Answer: C

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110. If $S_n = \frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \ldots\ldots$ to n terms, then $\lim_{n \to \infty} S_n$ equals :

A. (1/5)

B. (1/3)

C. ∞

D. 3

Answer: B

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111. $\lim_{x \to 1} \frac{x^2 - 1}{|x - 1|} =$

A. 2

B. (-2)

C. ∞

D. does not exist

Answer: D

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112. If $f(x) = \begin{cases} \frac{1}{1+e^{\frac{1}{x}}} & x \neq 0 \\ 0 & x = 0 \end{cases}$ then f(x) is

A. continuous as well differentiable at x =0

B. continuous but not differentiable at x =0

C. differentiable but not continuous at x =0

D. discontinuous at x=0

Answer: D

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113. The right hand and left hand limit of the function $f(x) = \begin{cases} \frac{e^{1/x}-1}{e^{1/x}+1}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0 \end{cases}$ are respectively

A. continuous as well differentiable at x =0

B. continuous but not differentiable at x =0

C. differentiable but not continuous at x =0

D. none of these

Answer: D

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114. Let $f(x) = \begin{cases} x, \text{ if x is irrational} \\ 0, \text{ if x is ratinal} \end{cases}$ then f is

A. f(x) continuous for all real x

B. f(x) is discontinuous for all x

C. f(x) is continuous only at x =1/2

D. f(x) is discontinuous only at x =1/2

Answer: C

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115. $f(x) = \frac{x^3 + x^2 - 16x + 20}{(x-2)^2}, x \neq 2$. The value which should be assigned to f(x) at x = 2, so that f(x) is continuous at x = 2 is

A. 0

B. 2

C. 3

D. 7

Answer: A

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116. Let $f(x) = \frac{\tan\left(\frac{\pi}{4} - x\right)}{\cot 2x}$, $x \neq \pi/4$, the value which should be assigned to f at $x = \pi/4$, so that it is continuous everywhere is :

A. 1

B. (1/2)

C. 2

D. (-1/2)

Answer: B

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117. For what value the function $f(x) = \frac{3x + 4\tan x}{x}$ at x = 0 is continuous

A. 5

B. 6

C. 7

D. 4

Answer: C

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118. If $f(x) = x.(\sin)\frac{1}{x}, x \neq 0$, then the value of the function at x = 0, so that the function is continuous at x = 0 is

A. 0

B. (-1)

C. 1

D. indeterminate

Answer: A

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119. The function $f(x) = |x| + \frac{|x|}{x}$ is

A. discontinuous at the origin becaue |x| is discontinuous there

B. continuous at the origin

C. discontinuous at the origin because |x| and |x|/x is discontinuous there

D. discontinuous at the origin because |x|/x is discontinuous there

Answer: D

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120. Consider $f(x) = \begin{cases} \frac{x^2}{|x|}, x \neq 0 \\ 0, x = 0. \end{cases}$

A. f(x) is discontinuous every where

B. f(x) is continuous every where

C. f(x) is not continuous only at x = 0

D. f(x) is continuous only at x = 0

Answer: B

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121. The value of f(2) so that $f(x) = \frac{2^{x+2} - 16}{4^x - 16}$ is continuous at x = 2 is

A. 2

B. (1/2)

C. (-2)

D. (-1/2)

Answer: B

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122. If $f(x) = \begin{cases} \frac{|x-1|}{x-1} & x \neq 1 \\ 0 & x = 1 \end{cases}$ then the correct statement is

A. f(x) is continuous and differentiable at x = 1

B. f(x) is discontinuous at x = 1

C. f(x) is discontinuous at $x < 1$

D. f(x) is discontinuous at $x > 1$

Answer: B

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123. The function $y = 3\sqrt{x} - |x - 1|$ is continuous at

A. x = 0

B. $x > 0$

C. $0 \leq x \leq 1$

D. $x \geq 0$

Answer: B

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124. Let $f(x) = \frac{\sqrt{1+\sin x} - \sqrt{1-\sin x}}{x}$lim The value, which should be assigned to f at x = 0 so that it is continuous everywhere, is :

A. 1

B. 2

C. (1/2)

D. (-2)

Answer: A

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125. To make $f(x) = (x+1)^{\cot x}$ continuous at $x = 0$, $f(0)$ must defined as

A. f(0) = 1/e

B. f(0) = 0

C. f(0) = e

D. f(0) = 2e

Answer: C

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126. if $f(x) = \frac{1}{1-x}(x \neq 1), \{f[f(x)]\}$ is

A. continuous no where

B. continuous every where

C. continuous for all x except x =1

D. continuous for all x except x = 0

Answer: D

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127. The value of b for which the function : $f(x) = \begin{cases} 5x - 4 & \text{if } 0 < x \leq 1 \\ 4x^2 + 3bx & \text{if } 1 < x < 2 \end{cases}$ is continuous at every point of its domain is :

A. (-1)

B. 0

C. 1

D. (13/3)

Answer: A

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128. If $f: R \to R$ is defined by $f(x) = \begin{cases} \frac{x+2}{x^2+3x+2} & x \in R - \{-1, -2\} \\ -1 & x = -2 \\ 0 & x = -1 \end{cases}$ then f is continuous on the set

A. R

B. R-{-2}

C. R-{-1}

D. R-{-1,-2}

Answer: C

Watch Video Solution

129. To make $f(x) = (x+1)^{\cot x}$ continuous at $x = 0$, $f(0)$ must defined as

A. 1/e

B. 0

C. e

D. (-1/e)

Answer: C

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130. The function $f(x) = |x - 2| + x$ is

A. continuous at x =1

B. discontinuous only at 0

C. discontinuous at 0,1

D. discontinuous every where

Answer: D

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131. If the function $f(x) = \begin{cases} \frac{\sin 3x}{x} & x \neq 0 \\ \frac{k}{x} & x = 0 \end{cases}$ is continuous at x = 0, then k =

A. 0

B. e

C. $\frac{1}{e^2}$

D. $e^{\frac{1}{3}}$

Answer: D

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132. Let $f(x) = \frac{1 - \cos px}{x \sin x}$, where $x \neq 0$ and $f(0) = \frac{1}{2}$. If f is continuous at 0, then p is equal to :

A. 1 or -1

B. (-2)

C. 2

D. (1/2)

Answer: A

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133. Let $f(x) = \begin{bmatrix} x^2 & x \leq 0 \\ ax + b & x > 0 \end{bmatrix}$ lim The values of a and b for which the function f(x) is continuous on the whole real line is :

A. a =1, b =0

B. a =0, b =1

C. a = 0, b=2

D. b = 0, a any real number

Answer: D

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134. If the function $f(x) = \begin{cases} ax - b & x \leq 1 \\ 3x & 1 < x < 2 \\ bx^2 - a & x \geq 2 \end{cases}$ is continuous at x =1 and discontinuous at x =2, then

A. a = 3+b, b =3

B. a = 3+b

C. $a = 3 + b, b \neq 3$

D. $a \neq 3 + b, b = 3$

Answer: C

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135. $y = \tan^{-1}\left(\frac{3x - x^3}{1 - 3x^2}\right), \frac{1}{\sqrt{3}}, x, \frac{1}{\sqrt{3}}.$

A. (-6)

B. 6

C. 5

D. (-5)

Answer: B

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136. $f(x) = \begin{cases} (\sin 2x)^{\tan^2 2x} & x \neq \frac{\pi}{4} \\ k & x = \frac{\pi}{4} \end{cases}$. If f(x) is continuous at $x = \frac{\pi}{4}$, then k =

A. $\sqrt{e}$

B. 1

C. 2

D. $\frac{1}{\sqrt{e}}$

Answer: D

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137. If $f(x) = \begin{cases} \frac{x^5 - 32}{x - 2} & x \neq 2 \\ k & x = 2 \end{cases}$ is continuous at x = 2, then k =

A. (1/8)

B. (1/4)

C. (1/2)

D. (1/6)

Answer: A

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138. If the function $f(x) = \begin{bmatrix} (\cos x)^{1/x} & x \neq 0 \\ k & x = 0 \end{bmatrix}$ is continuous at x = 0, value of k is :

A. 1

B. 0

C. e

D. (-1)

Answer: A

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139. If $f(x) = \begin{cases} 3x - 4 & 0 \leq x \leq 2 \\ 2x + \lambda & 2 < x \leq 3 \end{cases}$ is continuous at x = 2, then $\lambda =$

A. (-2)

B. (-1)

C. 0

D. 2

Answer: A

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140. If $f(x) = \frac{2x^3 - ax + 3}{x - 3}$ is continuous at x = 3, then

A. a = 19, f(3) = 35

B. a = 19, f(3) =0

C. a = -19, f(3) =35

D. a = -19, f(3) =0

Answer: A

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141. If $[x]^2 - 5[x] + 6 = 0$, where $[.]$ denotes the greatest integer function, then :

A. (-1)

B. 1

C. non existence

D. 0

Answer: C

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142. $\lim_{x \to \infty} \frac{\log x}{[x]}$, where [.] denotes the greatest integer function, is

A. 0

B. 1

C. (-1)

D. non existent

Answer: A

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143. If f(x) is an odd function and $\lim_{x \to 0}$ f(x) exists, then $\lim_{x \to 0} f(x)$ is

A. 0

B. (-1)

C. 1

D. (-1/2)

Answer: A

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144. $\lim_{x \to 0} \frac{\sin x}{x(1+\cos x)}$ is equal to :

A. 0

B. (1/2)

C. 1

D. (-1)

Answer: B

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145. $\lim_{x \to \frac{\pi}{2}} \frac{1-\sin x}{\cos x}$ is equal to :

A. 0

B. (-1)

C. 1

D. non existent

Answer: A

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146. $\lim_{x \to 0} \frac{|x|}{x}$ is equal to :

A. 1

B. (-1)

C. 0

D. non existent

Answer: D

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147. $\lim_{x \to 1} [x - 1]$, where $[\cdot]$ is the greatest integer function is equal to :

A. 1

B. 2

C. 0

D. non existent

Answer: D

Watch Video Solution

148. $\lim_{x \to 0} x \sin \frac{1}{x}$ is equal to :

A. 0

B. 1

C. (1/2)

D. non existent

Answer: A

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149. $\lim_{n \to \infty} \frac{1+2+3+\ldots..+n}{n^2}, n \in N$ is equal to :

A. 0

B. 1

C. (1/2)

D. (1/4)

Answer: C

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150. $\lim_{x \to \pi} \frac{\sin x}{x - \pi}$ is

A. 1

B. 2

C. (-1)

D. (-2)

Answer: C

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151. $\lim_{x \to 0} \frac{x^2 \cos x}{1 - \cos x}$ is

A. 2

B. (3/2)

C. (-3/2)

D. 1

Answer: A

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152. $\lim_{x \to 0} \frac{(1+x)^n - 1}{x}$ is

A. n

B. 1

C. (-n)

D. 0

Answer: A

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153. The value of $\lim_{\theta \to 0} \frac{1 - \cos 4\theta}{1 - \cos 6\theta}$ is

A. (4/9)

B. (1/2)

C. (-1/2)

D. 1

Answer: A

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154. $\lim_{x \to 0} \frac{\cos ecx - \cot x}{x}$ is

A. (-1/2)

B. 1

C. (1/2)

D. 1

Answer: C

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155. $\lim_{x \to 0} \frac{\sin x}{\sqrt{x+1} - \sqrt{1-x}}$ is :

A. 2

B. 0

C. 1

D. (-1)

Answer: C

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156. $\lim_{x \to \frac{\pi}{4}} \frac{\sec^2 x - 2}{\tan x - 1}$ is

A. 3

B. 1

C. 0

D. 2

Answer: D

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157. $\lim_{x \to 1} \frac{\left(\sqrt{x} - 1\right)(2x - 3)}{2x^2 + x - 3}$ is :

A. (1/10)

B. (-1/10)

C. 1

D. none of these

Answer: B

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158. If $f(x) = \begin{bmatrix} \frac{\sin[x]}{[x]} & [x] \neq 0 \\ 0 & [x] = 0 \end{bmatrix}$, then $\lim_{x \to 0} f(x)$ is :

A. 1

B. 0

C. (-1)

D. none of these

Answer: D

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159. $\lim_{x \to 0} \frac{|\sin x|}{x}$ is

A. 1

B. (-1)

C. non existent

D. none of these

Answer: C

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160. Let $f(x) = \begin{cases} x^2 - 1 & 0 < x < 2 \\ 2x + 3 & 2 \leq x < 3 \end{cases}$, the quadratic equation whose roots are $\lim_{x \to 2^-} f(x)$ and $\lim_{x \to 2^+} f(x)$ is :

A. $x^2 - 6x + 9 = 0$

B. $x^2 - 7x + 8 = 0$

C. $x^2 - 14x + 49 = 0$

D. $x^2 - 10x + 21 = 0$

Answer: D

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161. $\lim_{x \to 0} \frac{\tan 2x - x}{3x - \sin x}$, is :

A. 2

B. (1/2)

C. (-1/2)

D. (1/4)

Answer: B

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162. The function $f(x)\begin{cases}\frac{\sin x}{x}+\cos x & x \neq 0 \\ k & x=0\end{cases}$ is continuous at x = 0, then the value of k is

A. 3

B. 2

C. 1

D. 1.5

Answer: B

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163. The function $f(x)=[x]$, where [x] denotes greatest integer function is continuous at _____

A. 4

B. (-2)

C. 1

D. 1.5

Answer: D

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164. The number of points at which the function $f(x) = \frac{1}{x - [x]}$ is :

A. 1

B. 2

C. 3

D. none of these

Answer: D

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165. Prove that the function defined by $f(x) = \tan x$ is a continuous function.

A. $\{n\pi : n \in Z\}$

B. $\{2n\pi : n \in Z\}$

C. $\left\{(2n+1)\frac{\pi}{2} : n \in Z\right\}$

D. $\left\{\frac{n\pi}{2} : n \in z\right\}$

Answer: C

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166. Let f(x) = |sin x|. Then

A. A. f is every where differentiable

B. B. f is every where continuous but not differentiable at

$x = n\pi, n \in Z$

C. C. f is every where continuous but not differentiable at

$x = (2n+1)\frac{\pi}{2}, n \in Z$

D. D. none of these

Answer: C

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167. The function f(x) = |x| + |x-1| is

A. continuous at x =0 as well as at x =1

B. continuous at x =1 but not at x =0

C. discontinuous at x = 0 as well as x =1

D. continuous at x = 0 but not at x =1

Answer: A

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168. The value of k which makes the function defined by :

$$f(x) = \begin{cases} \sin\frac{1}{x} & \text{if} \quad x \neq 0 \\ k & \text{if} \quad x = 0 \end{cases}$$ continuous at x = 0 is :

A. 8

B. 1

C. (-1)

D. none of these

Answer: D

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169. If f(x) = 2x and $g(x) = \frac{x^2}{2} + 1$, then which of the following can be discontinuous function

A. f(x) + g(x)

B. f(x) - g(x)

C. f(x) . g(x)

D. (g(x))/(f(x))

Answer: D

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170. The function $f(x) = \frac{4 - x^2}{4x - x^2}$ is

A. discontinuous at only one point

B. discontinuous at exactly two points

C. discontinuous at exactly three points

D. none of these

Answer: C

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171. The function f(x) = cot x discontinuous on the set

A. $\{x = n\pi : n \in Z\}$

B. $\{x = 2n\pi : n \in Z\}$

C. $\left\{x = (2n+1)\frac{\pi}{2} : n \in Z\right\}$

D. $\left\{x = \frac{2\pi}{2} : n \in Z\right\}$

Answer: A

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172. If $f(x) = x^2 \sin \frac{1}{x}$, where $x \neq 0$, then the value of the function 'f' at x = 0, so that the function is continuous at x = 0, is :

A. 0

B. (-1)

C. 1

D. none of these

Answer: A

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173. If $f(x) = \begin{cases} mx + 1 & x \leq \frac{\pi}{2} \\ \sin x + n & x > \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, then

A. m = 1, n =0

B. $m = \frac{n\pi}{2} + 1$

C. $n = \frac{m\pi}{2}$

D. $m = n = \frac{\pi}{2}$

Answer: C

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174. $\lim_{n \to \infty} \frac{1^2 + 2^2 + ... + n^2}{2n^3 + 3n^2 + 4n + 1} =$

A. (1/2)

B. (1/6)

C. (1/10)

D. (1/12)

Answer: B

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175. $\lim_{x \to 0} \frac{1 - \cos x}{x^2}$ is :

A. (-1/2)

B. 91/2)

C. 2

D. (2/3)

Answer: B

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176. $\underset{x \to \infty}{\text{Lt}} \sqrt{x}\left(\sqrt{x+a} - \sqrt{x}\right) =$

A. a/2

B. (-a/2)

C. a

D. (-a)

Answer: A

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177. $\lim_{x \to \infty} \left(1 + \frac{2}{n}\right)^{2n} =$

A. e

B. e^2

C. e^4

D. e^6

Answer: C

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178. $\lim_{x \to 0} (1 + ax)^{\frac{b}{x}} =$

A. e^{ab}

B. e^{a+b}

C. e^{a^b}

D. e

Answer: A

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179. $\lim_{\theta \to 0} \frac{1 - \cos\theta}{\theta . \cos\theta} =$

A. 1/2

B. $\sqrt{2}$

C. 0

D. 2

Answer: C

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180. $\lim_{0 \to \frac{\pi}{4}} \frac{\sin\theta.\cos\theta}{\theta - \frac{\pi}{4}} =$

A. $\sqrt{2}$

B. 1

C. 0

D. $\frac{\pi}{4}$

Answer: A

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181. $\lim_{x \to 0} \frac{3^x - 2^x}{x} =$

A. (2/3)

B. log (3/2)

C. 1

D. 0

Answer: B

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182. $\lim_{x \to -1} \frac{x^9 + 1}{x^{14} - 1} =$

A. (9/14)

B. (3/7)

C. (-9/14)

D. (-1)

Answer: C

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183. The value of $\lim_{x \to 0} \left(\frac{1 + 5x^2}{1 + 3x^2} \right)^{1/x^2}$ is :

A. e

B. e^2

C. e^3

D. none of these

Answer: B

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184. $\lim_{x \to 0} \frac{e^x + e^{-x} - 2}{x^2} =$

A. $(\log 3)^2$

B. $(\log 9)^2$

C. 2 log 9

D. log 9

Answer: B

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185. $\lim_{x \to \infty} \left(1 + \frac{4}{x - 1}\right)^{x+3} =$

A. e^4

B. e^3

C. e^2

D. e

Answer: A

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186. $\lim_{x \to 0} \frac{2}{x} \log(1 + x) =$

A. e^2

B. e

C. 2

D. (1/2)

Answer: C

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187. $\lim_{x \to 1} (1-x)\tan\left(\frac{\pi}{2}x\right) =$

A. 0

B. $\frac{2}{\pi}$

C. $\frac{\pi}{2}$

D. 1

Answer: B

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188. If f be a function such that f(9) = 9 and f'(9) = 3, then :

$\lim_{x \to 9} \frac{\sqrt{f(x)} - 3}{\sqrt{x} - 3}$ is :

A. 3

B. 4

C. 44228

D. (1/2)

Answer: B

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189. $\lim_{x \to 0} \frac{2^x - 1}{(1+x)^{\frac{1}{2}} - 1} =$

A. log 4

B. 2

C. $\log_e^2$

D. $\frac{\log_e^2}{2}$

Answer: D

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190. $\lim_{x \to 0} \frac{a^{\sin x} - 1}{b^{\sin x} - 1} =$

A. (log a)/(log b)

B. (log b)/(log a)

C. a/b

D. b/a

Answer: A

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191. The value of $\lim_{x \to 0} \left(\frac{e^x - 1}{x} \right)$

A. 0

B. 1

C. ∞

D. (1/2)

Answer: B

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192. If $f(x) = \begin{bmatrix} \frac{\sin[x]}{[x]} & [x] \neq 0 \\ 0 & [x] = 0 \end{bmatrix}$, then $\lim_{x \to 0} f(x)$ is :

A. (1/2)

B. (1/4)

C. 1

D. 0

Answer: C

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193. Let f(x+y) = f(x).f(y), $\forall, x, y.$ Suppose f(5) =2, $f'(0) = 3$ then $f'(5) =$

A. 4

B. 3

C. 8

D. 6

Answer: D

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194. If $f(x) = \begin{cases} \frac{1-\cos 4x}{x^2} & x < 0 \\ a & x = 0 \\ \frac{\sqrt{x}}{\sqrt{16+\sqrt{x}}-4} & x > 0 \end{cases}$ then the value of a for which f(x) is continuous at x = 0 is

A. 5

B. 8

C. 4

D. 3

Answer: B

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195. The value of $\lim_{x \to 0} \frac{\sqrt{a+x} - \sqrt{a-x}}{x} =$

A. $\sqrt{a}$

B. $\frac{1}{\sqrt{a}}$

C. 0

D. 1

Answer: B

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196. The value of $\lim_{x \to \pi} \frac{\sqrt{2 + \cos x} - 1}{(\pi - x)^2}$ is

A. 2

B. (1/4)

C. 0

D. (1/2)

Answer: B

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197. If $f(x) = \begin{vmatrix} \sin x & \cos x & \tan x \\ x^3 & x^2 & x \\ 2x & 1 & x \end{vmatrix}$, then $Lt_{x \to 0} \frac{f(x)}{x^2} =$

A. 3

B. (-1)

C. 0

D. 1

Answer: D

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198. If $f(a) = 2, f'(a) = 1, g(a) = -3, g'(a) = -1$ then $\lim_{x \to a} \frac{f(a)g(x) - f(x)g(a)}{x - a} =$

A. 6

B. 1

C. (-1)

D. (-5)

Answer: B

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199. $\lim_{x \to 0} (1 - ax)^{\frac{1}{x}} =$

A. e^{-a}

B. e

C. e^{a}

D. 1

Answer: A

Watch Video Solution

200. $\lim_{n \to \infty} (3^n + 4^n)^{\frac{1}{n}} =$

A. 4

B. 3

C. e

D. ∞

Answer: A

Watch Video Solution

201. $\lim_{x \to \infty} \left(1 - \frac{4}{x-1}\right)^{3x-1} =$

A. e^{12}

B. e^{-12}

C. e^{4}

D. e^{3}

Answer: B

Watch Video Solution

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202. The value of $\lim_{x \to 1} \frac{\tan^2(x-1)}{x^3 - x^2 - x + 1} =$

A. 0

B. 1

C. 2

D. (1/2)

Answer: D

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203. $\lim_{\theta \to \frac{\pi}{2}} \frac{\frac{\pi}{2} - \theta}{\cot \theta} =$

A. 0

B. (-1)

C. 1

D. ∞

Answer: C

Watch Video Solution

204. $\lim_{x \to 0} \frac{\tan x - \sin x}{x^3} =$

A. (1/2)

B. (-1/2)

C. 0

D. 1

Answer: A

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205. The value of $\lim_{x \to 0} \frac{5^x - 5^{-x}}{2x} =$

A. 0

B. log 5

C. 2 log 5

D. 1

Answer: B

Watch Video Solution

206. $\lim_{x-1} \frac{\tan(x^2 - 1)}{x - 1}$ is equal to

A. (1/2)

B. 2

C. (-1)

D. (-2)

Answer: B

Watch Video Solution

207. The value of $\lim_{x \to \infty} \frac{3^{x+1} - 5^{x+1}}{3^x - 5^x}$ is

A. 5

B. (1/5)

C. (-5)

D. (-1/5)

Answer: A

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208. If $G(x) = -\sqrt{25 - x^2}$ the $\lim_{x \to 1} \frac{G(x) - G(1)}{x - 1} =$

A. (1/24)

B. (1/5)

C. $\frac{1}{\sqrt{24}}$

D. none of these

Answer: D

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209. $\lim_{n \to \infty} \left(\frac{1}{1 - n^2} + \frac{2}{1 - n^2} + \ldots\ldots + \frac{n}{1 - n^2} \right)$ is :

A. 0

B. (-1/2)

C. (1/2)

D. 1

Answer: B

Watch Video Solution

210. $\lim_{x \to \infty} \frac{(2+x)^{40}(4+x)^{5}}{(2-x)^{45}}$ is :

A. (-1)

B. 1

C. 16

D. 32

Answer: A

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211. $\lim_{x \to \infty} \frac{x^n}{e^x} = 0$ (n is an integer) for

A. no values of n

B. all values of n

C. only negative values of n

D. only positive values of n

Answer: B

Watch Video Solution

212. If $f(x) = \sqrt{\frac{x - \sin x}{x + \cos^2 x}}$, then $\lim_{x \to \infty} f(x) =$

A. 0

B. ∞

C. 1

D. none of these

Answer: C

Watch Video Solution

213. $\lim_{x \to 0} \left\{ \tan\left(\frac{\pi}{4} + x \right) \right\}^{\frac{1}{x}} =$

A. e

B. e^2

C. $\sqrt{e}$

D. $\frac{1}{\sqrt{e}}$

Answer: B

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214. The value of $\lim_{x \to 0} \left(\frac{1 + 5x^2}{1 + 3x^2} \right)^{1/x^2}$ is :

A. e^2

B. e

C. e^{-1}

D. e^{-2}

Answer: A

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215. $\lim_{x \to 1} \frac{\sqrt{1 - \cos 2(x - 1)}}{x - 1}$:

A. $\sqrt{2}$

B. $-\sqrt{2}$

C. $\frac{1}{\sqrt{2}}$

D. does not exist

Answer: D

Watch Video Solution

216. $\lim_{x \to 0} \frac{\sin\left(\pi \cos^2 x\right)}{x^2}$ is equal to :

A. $-\pi$

B. π

C. $\frac{\pi}{2}$

D. 1

Answer: B

Watch Video Solution

217. Let $f: R \to R$ be such that $f(1) = 3$ and $f(1) = 6$. Then $\lim_{x \to 0} \left(\frac{f(1+x)}{f(1)} \right)^{1/x}$ equal

A. 1

B. $e^{\frac{1}{2}}$

C. e^2

D. e^3

Answer: C

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218. $\lim_{x \to 0} \frac{\sin nx[(a-n)nx - \tan x]}{x^2} = 0$, where n is non-zero positive integer, tehn a is equal to :

A. (n+1)/n

B. n^2

C. 1/n

D. n+1/n

Answer: D

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219. $\lim_{x \to 0} \frac{\sqrt{1 - \cos 2x}}{\sqrt{2}x}$ is :

A. 1

B. (-1)

C. 0

D. does not exist

Answer: D

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220. $\lim_{x \to \infty} \left(\frac{x^2 + 5x + 3}{x^2 + x + 2} \right)^x$ is :

A. e^4

B. e^2

C. e^3

D. e

Answer: A

Watch Video Solution

221. For $x \in R$, $\lim_{x \to \infty} \left(\frac{x - 3}{x + 2} \right)^x$ is equal to :

A. e

B. e^{-1}

C. e^{-5}

D. e^{5}

Answer: C

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222. The value of $\lim_{n \to \infty} \frac{1 + 2^4 + 3^4 + \ldots.. + n^4}{n^5} - \lim_{n \to \infty} \frac{1 + 2^3 + 3^3 + \ldots.. + n^3}{n^5}$ is :

A. zero

B. (1/4)

C. (1/5)

D. (1/30)

Answer: C

Watch Video Solution

223. $\lim_{x \to 0} \frac{\log(3+x) - \log(3-x)}{x} = k$, the value of k is :

A. 0

B. (1/3)

C. (2/3)

D. (-2/3)

Answer: C

Watch Video Solution

224. The value of $\lim_{x \to 0} \frac{\int_0^{x^2} \sec^2 t dt}{x \sin x}$ is :

A. 2

B. 1

C. 0

D. 3

Answer: B

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225. $\lim_{x \to \frac{\pi}{2}} \frac{(1 - \tan x/2)(1 - \sin x)}{(1 + \tan x/2)(\pi - 2x)^3}$ is :

A. (1/8)

B. 0

C. (1/32)

D. ∞

Answer: C

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226. If $\lim_{h \to 0} \left(1 + \frac{a}{x} + \frac{b}{x^2}\right)^{2x} = e^2$, then the values of a and b, are :

A. $a \in R, b = 2$

B. $a = 1, b \in R$

C. $a \in R, b \in R$

D. a =1, b =2

Answer: B

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227. Let α and β be the distinct roots of $ax^2 + bx + c = 0$, then $\lim_{x \to \alpha} \frac{1 - \cos\left(ax^2 + bx + c\right)}{(x - \alpha)^2}$ is equal to :

A. 0

B. $\frac{a^2}{2}(\alpha-\beta)^2$

C. $\frac{1}{2}(\alpha-\beta)^2$

D. $-\frac{a^2}{2}(\alpha-\beta)^2$

Answer: B

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228. Let $a=\lim_{n\to\infty}\frac{1+2+3+\ldots.+n}{n^2}=$, b = $\lim_{n\to\infty}\frac{1^2+2^2+\ldots.+n^2}{n^3}=$ then

A. (1/6)

B. (1/3)

C. (-1)

D. (1/2)

Answer: B

Watch Video Solution

229. If a,b, c, d are positive, then $\lim_{x \to \infty} \left(1 + \frac{1}{a + bx}\right)^{c + dx} =$

A. $e^{\frac{a}{b}}$

B. $e^{\frac{c}{a}}$

C. $e^{\frac{(c+d)}{(a+b)}}$

D. e

Answer: A

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230. $\lim_{x \to 0} \frac{a^x - b^x}{x} =$

A. $x.\, a^{x-1} - x.\, b^{b-1}$

B. log a/b

C. log b/a

D. does not exist

Answer: B

Watch Video Solution

231. $\lim_{x \to 1} \frac{\sqrt{x-1} + \sqrt{x-1}}{\sqrt{x^2-1}} =$

A. (1/2)

B. $\sqrt{2}$

C. 1

D. $\frac{1}{\sqrt{2}}$

Answer: B

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232. $\lim_{x \to 0} \frac{x}{\sqrt{x+4}-2} =$

A. 4

B. $\sqrt{2}$

C. $2\sqrt{2}$

D. $\frac{1}{\sqrt{2}}$

Answer: A

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233. $\lim_{x \to 0} \left[\frac{(\log(1+x))}{x}\right] =$

A. 0

B. 1

C. e

D. 1/e

Answer: B

Watch Video Solution

234. $\lim_{x \to \infty} \left(\frac{a^{\frac{1}{x}} + b^{\frac{1}{x}} + c^{\frac{1}{x}}}{3} \right)^x$, where a, b, c are real and non zero

=

A. 0

B. $(abc)^{\frac{1}{3}}$

C. $(abc)^{-\frac{1}{3}}$

D. 1

Answer: B

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235. $\lim_{x \to \infty} \left(\frac{2x + 7 \sin x}{4x + 3 \cos x} \right) =$

A. 1

B. (-1)

C. (1/2)

D. (-1/2)

Answer: C

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236. $\lim_{x \to 0} \frac{\log(1 + x)}{3^x - 1} =$

A. $\log_e 3$

B. 0

C. 1

D. $\log_3 e$

Answer: D

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237. $\lim_{\theta \to \frac{\pi}{2}} \frac{1 - \sin\theta}{\left(\frac{\pi}{2} - \theta\right)\cos\theta} =$

A. 1

B. (-1)

C. (-1/2)

D. (1/2)

Answer: D

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238. $\lim_{x \to 0} \frac{x.10^x - x}{1 - \cos x} =$

A. log 10

B. 2 log 10

C. 3 log 10

D. 4 log 10

Answer: B

Watch Video Solution

239. $\lim_{x \to \infty} \left(\frac{x + a}{x + b} \right)^{x+b} =$

A. 1

B. e^{b-a}

C. e^{a-b}

D. e^{b}

Answer: C

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240. If $f(x) = \begin{cases} 2x+b & x < \alpha \\ x+d & x \geq a \end{cases}$ is such that $\lim_{x \to \alpha} f(x) = l$, then l =

A. 2d-b

B. 2b-d

C. 2d+b

D. b-2d

Answer: A

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241. The quadratic equation whose roots are l and m, where $l = \lim_{\theta \to 0} \frac{3\sin\theta - 4\sin^2\theta}{\theta}$ and $m = \lim(\theta \to 0)\frac{2\tan\theta}{\theta(1-\tan^2\theta)}$ is

A. $x^2 + 5x + 6 = 0$

B. $x^2 - 5x + 6 = 0$

C. $x^2 - 5x - 6 = 0$

D. $x^2 + 5x - 6 = 0$

Answer: B

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242. $\lim_{x \to 0} \frac{4^x - 9^x}{x \cdot (4^x + 9^x)} =$

A. (log) 2/3

B. (log) 3/2

C. 1/2 (log) 2/3

D. 1/2 (log) 3/2

Answer: A

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243. If $\lim_{x \to a} \frac{a^x - x^a}{x^x - a^a} = -$, then :

A. 0

B. 1

C. e

D. 2e

Answer: B

Watch Video Solution

244. $\lim_{x \to \frac{\pi}{6}} \left(\frac{3 \sin x - \sqrt{3} \cos x}{6x - \pi} \right) =$

A. $\sqrt{3}$

B. $\frac{1}{\sqrt{3}}$

C. $-\frac{1}{\sqrt{3}}$

D. $-\sqrt{3}$

Answer: B

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245. $\lim_{n \to \infty} \frac{1}{n^3} \sum_{k=1}^{n} k^2 x =$

A. x

B. x/2

C. x/3

D. x/4

Answer: C

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246. If $f: R \to R$ is defined by $f(x) = \begin{cases} \frac{x+2}{x^2+3x+2} & x \in R - \{-1, -2\} \\ -1 & x = -2 \\ 0 & x = -1 \end{cases}$ then f is continuous on the set

A. A. 0

B. B. (-1)

C. C. 1

D. D. (-1/2)

Answer: B

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247. If $\lim_{x \to 0} \left(\frac{\cos 4x + a \cos 2x + b}{x^4} \right)$ is finite, then the values of a and b are respectively.

A. (5,-4)

B. (-5,-4)

C. (-4,3)

D. 4,5

Answer: C

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248. $\lim_{x \to \infty} \left\{ \sqrt{x^2 + 5x - 7} - x \right\} =$

A. A. ∞

B. B. (1/2)

C. C. 4

D. D. 1

Answer: D

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249. $\lim_{x \to \frac{\pi}{6}} \frac{2\sin^2 x + \sin x - 1}{2\sin^2 x - 3\sin x - 1} =$

A. 3

B. (-3)

C. 6

D. 0

Answer: B

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250. Let $f(2) = 4$ and $f'(2) = 4$.

Then $\lim_{x \to 2} \frac{xf(2) - 2f(x)}{x - 2}$ is given by :

A. 2

B. (-2)

C. (-4)

D. 3

Answer: C

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251. The value of the constant α and β such that $\lim_{x \to \infty} \left(\frac{x^2 + 1}{x + 1} - \alpha x - \beta \right) = 0$ are respectively

A. (1,1)

B. (-1,1)

C. (1,-1)

D. (0,1)

Answer: C

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252. $\lim_{\theta \to 0} \frac{4\theta(\tan\theta - \sin\theta)}{(1 - \cos 2\theta)^2}$ is

A. $\frac{1}{\sqrt{2}}$

B. (1/2)

C. 1

D. 2

Answer: D

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253. For $x \in R$, $\lim_{x \to \infty} \left(\frac{x-3}{x+2} \right)^x$ is equal to :

A. 1/e

B. $\frac{1}{e^2}$

C. 2/e

D. e

Answer: B

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254. $\lim_{x \to 0} \frac{\cos(\sin x) - 1}{x^2} =$

A. 1

B. (-1)

C. (1/2)

D. (-1/2)

Answer: D

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255. $\lim_{x \to -2} \frac{\sin^{-1}(x+2)}{x^2 + 2x} =$

A. 0

B. ∞

C. (-1/2)

D. none of these

Answer: C

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256. $\lim_{n \to \infty} \left(\frac{n^2 - n + 1}{n^2 - n - 1} \right)^{n(n-1)} =$

A. e

B. e^2

C. e^{-1}

D. 1

Answer: B

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257. The value of $\lim_{x \to 0} \frac{\sqrt{\frac{1}{2}(1 - \cos 2x)}}{x}$ is :

A. 1

B. (-1)

C. 0

D. none of these

Answer: D

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258. The value of $\lim_{x \to 0} \frac{\int_0^{x^2} \cos t^2 dt}{x \sin x}$ is :

A. (3/2)

B. 1

C. (-1)

D. none of these

Answer: B

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259. $\lim_{x \to 0} \frac{\sin nx[(a-n)nx - \tan x]}{x^2} = 0$, where n is non-zero positive integer, tehn a is equal to :

A. 0

B. $\frac{n+1}{n}$

C. n

D. $n + \frac{1}{n}$

Answer: D

Watch Video Solution

260. Let $f(2) = 4$ and $f'(2) = 4$.

Then $\lim_{x \to 2} \frac{xf(2) - 2f(x)}{x - 2}$ is given by :

A. 2

B. (-2)

C. (-4)

D. 3

Answer: C

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261. $\lim_{x \to \infty} \frac{\log x^n - [x]}{[x]}$, where $n \in N$ and [.] denotes the greatest integer function, is

A. 1

B. (-1)

C. 0

D. none of these

Answer: B

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262. Let f(a) = g(a) = k and their n^{th} order derivatives exist and are not equal for some $n \in N$, further if $\lim_{x \to a} \frac{f(a)g(x) - f(a) - g(a)f(x) + g(a)}{g(x) - f(x)} = 4$ then the value of k is

A. 0

B. 4

C. 2

D. 1

Answer: D

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263. Let $f: R \to R$ be a positive increasing function with $\lim_{x \to \infty} \frac{f(3x)}{f(x)} = 1$. Then $\lim_{x \to \infty} \frac{f(2x)}{f(x)} =$

A. (3/2)

B. 3

C. 1

D. (2/3)

Answer: C

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264. $\lim_{x \to 0} x^2 . \sin\left(\frac{\pi}{x}\right)$ is

A. 1

B. 0

C. non existent

D. ∞

Answer: B

Watch Video Solution

265. If $0 < x < y$, then $\lim_{n \to \infty} (y^n + x^n)^{\frac{1}{n}}$ is equal to

A. e

B. x

C. y

D. none of these

Answer: C

Watch Video Solution

266. The value of $\lim_{x \to 0} \frac{e^x - e^{\sin x}}{2(x - \sin x)} =$

A. (-1/2)

B. (1/2)

C. 1

D. (3/2)

Answer: B

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267. If $f(x) = \begin{cases} \frac{\sin(1+[x])}{[x]} & f \text{ or } [x] \neq 0 \\ 0 & f \text{ or } [x] = 0 \end{cases}$, where [x] denotes the greatest integer not exceeding x, then, $\lim_{x \to 0^-} f(x) =$

A. (-1)

B. 0

C. 1

D. 2

Answer: B

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268. If $f: R \to R$ is defined by f(x) = [x-3]+|x-4| for $x \in R$, then $\lim_{x \to 3^-} f(x)$ is equal to

A. (-2)

B. (-1)

C. 0

D. 1

Answer: C

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269. $\lim_{x \to 0} \frac{(1 - e^x)\sin x}{x^2 + x^3} =$

A. -1

B. 0

C. 1

D. 2

Answer: A

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270. $\lim_{x \to 0} \frac{\sqrt{1+x}-1}{x} =$

A. (1/2)

B. 2

C. 0

D. 1

Answer: A

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271. If $f(x) = \begin{bmatrix} \frac{\sin[x]}{[x]} & [x] \neq 0 \\ 0 & [x] = 0 \end{bmatrix}$, then $\lim_{x \to 0} f(x)$ is :

A. 1

B. 0

C. (-1)

D. none of these

Answer: D

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272. The value of $\lim_{x \to k^-} x - [x]$, where k is an integer, is

A. (-1)

B. 1

C. 0

D. 2

Answer: B

Watch Video Solution

273. The value of $\lim_{x \to 0} \frac{1 - \cos(1 - \cos x)}{x^4}$ is

A. (1/8)

B. (1/2)

C. (1/4)

D. none of these

Answer: A

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274. $\lim_{x \to 3} [x] =$

A. 2

B. 3

C. non existence

D. none of these

Answer: C

Watch Video Solution

275. $\lim_{x \to 1} \frac{x^8 - 2x + 1}{x^4 - 2x + 1} =$

A. 3

B. 0

C. (-3)

D. 1

Answer: A

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276. If $f(x) = \sqrt{\frac{x - \sin x}{x + \cos^2 x}}$, then $\lim_{x \to \infty} f(x) =$

A. 0

B. ∞

C. 1

D. none of these

Answer: C

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277. $\lim_{n \to \infty} \left(1 + (\sin)\frac{a}{n}\right)^n$ equals

A. e^a

B. e

C. e^{2a}

D. 0

Answer: A

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278. $\lim_{x \to 0} \frac{4^x - 1}{3^x - 1} =$

A. $\log_3 4$

B. $\log_4 3$

C. $\log_e 4$

D. 1

Answer: A

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279. The value of $\lim_{n \to \infty} \left\{ \frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \ldots + \frac{1}{(2n+1)(2n+3)} \right\}$ is

A. 1

B. (1/2)

C. (-1/2)

D. none of these

Answer: B

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280. The valueof $\lim_{x \to 0} \frac{e^{ax} - e^{bx}}{x}$ is

A. a+b

B. a-b

C. e^{ab}

D. 1

Answer: B

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281. If $S_1 = \sum n, S_2 = \sum n^2, S_3 = \sum n^3$ then $\lim_{n \to \infty} \frac{s_1\left(1 + \frac{s_3}{8}\right)}{s_2^2} =$

A. $\frac{3}{32}$

B. $\frac{3}{64}$

C. $\frac{9}{32}$

D. $\frac{9}{64}$

Answer: D

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282. The value of $\lim_{x \to 0} \frac{(4^x - 1)^3}{\sin\left(\frac{x^2}{4}\right)\log(1 + 3x)}$ is

A. $\frac{4}{3}(\log 4)^2$

B. $\frac{4}{3}(\log 4)^3$

C. $\frac{3}{2}(\log 4)^2$

D. $\frac{3}{2}(\log 4)^3$

Answer: B

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283. $\lim_{x \to 0} x \log_e(\sin x)$ is equal to

A. 1)(-1)

B. 2)$\log_e 1$

C. 3)0

D. 4)none of these

Answer: B

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284. The value of $\lim_{n \to \frac{\pi}{2}} \frac{\cot x - \cos x}{(\pi - 2x)^3}$, is

A. (1/2)

B. (1/4)

C. (1/8)

D. (1/16)

Answer: D

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285. The value of $\lim_{x \to \infty} \frac{\sin x}{x}$ is

A. 1

B. 0

C. (-1)

D. none existence

Answer: B

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286. $\lim_{x \to 0} \frac{e^{\frac{1}{x}} - 1}{e^{\frac{1}{x}} + 1} =$

A. (-1)

B. 1

C. 0

D. does not exist

Answer: D

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287. The value of $\lim_{x \to \infty} \left[\sqrt{a^2x^2 + ax + 1} - \sqrt{a^2x^2 + 1}\right]$ is

A. (1/2)

B. 1

C. 2

D. none of these

Answer: A

Watch Video Solution

288. $\lim_{x \to \infty} \left(1 - \frac{4}{x-1}\right)^{3x-1} =$

A. e^{12}

B. e^{-12}

C. e^{4}

D. e^{3}

Answer: B

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289. $\lim_{x \to 0} \frac{a^x - b^x}{e^x - 1} =$

A. log (a/b)

B. log (b/a)

C. log ab

D. log (a + b)

Answer: A

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290. The value of $\lim_{x \to 2} \frac{5}{\sqrt{2} - \sqrt{x}}$ is

A. $10\sqrt{2}$

B. ∞

C. $-\infty$

D. non existent

Answer: D

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291. The value of $\lim_{x \to 2} \frac{e^{3x-6} - 1}{\sin(2-x)}$ is

A. (3/2)

B. 3

C. (-3)

D. (-1)

Answer: C

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292. $\lim_{x \to \frac{\pi}{2}} \frac{a^{\cot x} - a^{\cos x}}{\cot x - \cos x}, a > 0$ is equal to

A. $\log_e\left(\frac{\pi}{2}\right)$

B. $\log_e 2$

C. $\log_e a$

D. a

Answer: C

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293. $\lim_{x \to \infty} \left(1 + \frac{2}{n}\right)^{2n} =$

A. 0

B. ∞

C. 5

D. (2/3)

Answer: C

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294. $\lim_{x \to 0} x \sin\frac{1}{x}$ is equal to :

A. 0

B. ∞

C. (1/2)

D. 2

Answer: D

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295. $\lim_{n \to \infty} \frac{3.2^{n+1} - 4.5^{n+1}}{5.2^n + 7.5^n} =$

A. (-20/7)

B. 0

C. (3/5)

D. (-4/7)

Answer: A

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296. $\lim_{n \to \infty} \left\{ n \sin \frac{2\pi}{3n} . \cos \frac{2\pi}{3n} \right\} =$

A. $\frac{\pi}{3}$

B. 1

C. $\frac{2\pi}{3}$

D. $\frac{\pi}{6}$

Answer: C

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297. $\lim_{x \to a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}} =$

A. (2/3)

B. $\frac{2}{\sqrt{3}}$

C. $\frac{3\sqrt{3}}{2}$

D. $\frac{2}{3\sqrt{3}}$

Answer: D

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298. $\lim_{x \to \infty} \left(1 + \frac{2}{n}\right)^{2n} =$

A. 3

B. (1/3)

C. (2/3)

D. ∞

Answer: B

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299. If f(9) =9, $f'(9) = 4$, then $\lim_{x \to 9} \frac{\sqrt{f(x)} - 3}{\sqrt{x} - 3} =$

A. 9

B. 3

C. 4

D. 7

Answer: C

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300. If $f(x) = \begin{cases} \frac{x^5 - 32}{x - 2} & x \neq 2 \\ k & x = 2 \end{cases}$ is continuous at x = 2, then k =

A. 16

B. 80

C. 32

D. 8

Answer: B

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301. The points of discontinuity of $f(x) = \tan\left(\frac{\pi x}{x + 1}\right)$

A. x = (2m-1)/(2m+1)

B. x = (2m+1)/(1-2m) (m is any integer)

C. $x = \pi$

D. x = 0

Answer: B

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302. If the function $f(x) = \begin{cases} \frac{x^2 - (a+2)x + a}{x-2} & x \neq 2 \\ 2 & x = 2 \end{cases}$ is continuous at x = 2, then :

A. 1

B. 0

C. (-1)

D. 3

Answer: B

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303. The value of f(0) so that the function $f(x) = \frac{2x - \sin^{-1} x}{2x + \tan^{-1} x}$ is continuous at each point of its domain

A. (2/3)

B. 2

C. (1/3)

D. (-1/3)

Answer: C

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304. How should we define $f(x) = \frac{\log(1 + ax) - \log(1 - bx)}{x}$ at x = 0 so as to make it continuous, at x = 0

A. a-b

B. log a +log b

C. a+b

D. loga a/b

Answer: C

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305. Which of the following is false ?

A. If f(x) is continuous at x = a, then $f(a) = \lim_{x \to a} f(x)$

B. If $\lim_{x \to a} f(x)$ exists then f(x) is continuous at x = a

C. If f(x) is differentiable at x = a, then it is continuous at x = a

D. If f(x) is continuous at x=a, then $\lim_{x \to a} f(x)$ exists

Answer: B

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306. If $f(x) = \begin{cases} x \sin\left(\frac{1}{x}\right), \text{if } x \neq 0 \\ 0 \quad , \text{if } x = 0 \end{cases}$ then at x=0 the function f is

A. differentiable and not continuous

B. continuous but not differentiable

C. not continuous

D. continuous and differentiable

Answer: B

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307. Let $f(x) = \begin{cases} \frac{\sin \pi x}{5x} & x \neq 0 \\ k & x = 0 \end{cases}$ If f(x) is continuous at x =0, then the value of k is

A. $\frac{\pi}{5}$

B. $\frac{5}{\pi}$

C. 1

D. 0

Answer: A

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308. The function $f(x) = |x| + \frac{|x|}{x}$ is

A. discontinuous at the origin becaue |x| is discontinuous there

B. continuous at the origin

C. discontinuous at the origin because |x| and |x|/x is discontinuous there

D. discontinuous at the origin because |x|/x is discontinuous there

Answer: A

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309. If $f(x) = \begin{cases} \frac{1-\cos x}{x} & x \neq 0 \\ k & x = 0 \end{cases}$ is continuous at x=0 then k=

A. 0

B. (1/2)

C. (1/4)

D. (-1/2)

Answer: C

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310. If $f(x) = \begin{cases} \frac{\sin 5x}{x^2+2x} & x \neq 0 \\ k + \frac{1}{2} & x = 0 \end{cases}$ is continuous at x = 0, then the value of k is

A. 2

B. (1/2)

C. 1

D. (-4)

Answer: D

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311. Which one of the following is not true always?

A. If f(x) is continuous at x = a, then it is differentiable at x = a

B. If f(x) is not continuous at x =a then it is not differentiable at x =a

C. If a function f(x) is continuous at x =a then $\lim_{x \to a} f(x)$ exist

D. If f(x) and g(x) are differentiable at x = a then f(x)+g(x) is also differentiable at x =a

Answer: A

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312. The points of discontinuity of $f(x) = \tan\left(\frac{\pi x}{x+1}\right)$

A. $x = \frac{2m-1}{1+2m}, m \in Z$

B. $x = \frac{2m+1}{1-2m}, m \in Z$

C. $x = \pi, 2\pi$

D. $x = 0, \pi$

Answer: C

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313. Let $f(x) = \begin{cases} -2\sin x & x \leq -\frac{\pi}{2} \\ a\sin x + b & -\frac{\pi}{2} < x < \frac{\pi}{2} \\ \cos x & x \geq \frac{\pi}{2} \end{cases}$ then values of a and b so that f(x) is continuous are

A. a = 1, b = 1

B. a =1, b =-1

C. a = -1, b =1

D. a = -1, b = -1

Answer: D

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314. Let $f(x) = \frac{1 - \tan x}{4x - \pi}, x \neq \frac{\pi}{4}, x \in \left[0, \frac{\pi}{2}\right]$, if f(x) is continuous in $\left[0, \frac{\pi}{4}\right]$, then $f\left(\frac{\pi}{4}\right)$ is :

A. (-1/2)

B. (1/2)

C. 1

D. (-1)

Answer: D

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315. Consider $f(x) = \begin{cases} \frac{x^2}{|x|}, x \neq 0 \\ 0, x = 0. \end{cases}$

A. f(x) is discontinuous every where

B. f(x) is continuous every where

C. $f'(x)$ exists in (-1,1)

D. $f'(x)$ exists in (-2,2)

Answer: C

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316. If the function $f(x) = \begin{cases} \frac{\sin 3x}{x} & x \neq 0 \\ \frac{k}{2} & x = 0 \end{cases}$ is continuous at x = 0, then k =

A. 3

B. 6

C. 9

D. 12

Answer: A

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317. If $f(x) = \dfrac{x^2 - 10x + 25}{x^2 - 7x + 10}$ for $x \neq 5$ and f is continuous at x=5, then f(5) =

A. 0

B. 5

C. 10

D. 25

Answer: D

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318. If $f: R \to R$ is defined by $f(x) = \begin{cases} a^2 \cos^2 + b^2 \sin^2 x & x \leq 0 \\ e^{ax+b} & x > 0 \end{cases}$ is continuous function, then

A. b = 2 log a

B. 2b = log a

C. b = log 2a

D. $b^2 = \log a$

Answer: C

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319. If $f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x} & -1 \leq x \leq 0 \\ 2x^2 + 3x - 2 & 0 \leq x \leq 1 \end{cases}$ is continuous at x = 0, thenk =

A. A. (-4)

B. B. (-3)

C. C. (-2)

D. D. (-1)

Answer: B

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320. If $f(x) = \begin{cases} \frac{1-\sqrt{2}\sin x}{\pi - 4x} & x \neq \frac{\pi}{4} \\ a & x = \frac{\pi}{4} \end{cases}$ is continuous at $\frac{\pi}{4}$, then a =

A. 4

B. 2

C. 1

D. (1/4)

Answer: D

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321. The value of b for which the function : $f(x) = \begin{cases} 5x - 4 & \text{if } 0 < x \leq 1 \\ 4x^2 + 3bx & \text{if } 1 < x < 2 \end{cases}$ is continuous at every point of its domain is :

A. (-1)

B. 0

C. 1

D. none of these

Answer: B

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322. The value of f(x) at x = 0, so that the function $f(x) = \frac{2^x - 2^{-x}}{x}, x \neq 0$ is continuous at x = 0

A. 0

B. log 2

C. 4

D. $\log 4$

Answer: D

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323. The function $f(x) = \frac{\log(1+ax) - \log(1-bx)}{x}$ is not defined at x = 0. The value which should be assigned to f at x = 0 so that it is continuous at x = 0 is :

A. log a + log b

B. 0

C. a-b

D. a+b

Answer: A

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324. The function f(x) = [x], where [x] denotes the greatest integer not greater than x, is

A. continuous only at rational values of x

B. continuous for real values of x

C. continuous only a positivie integral values of x

D. continuous for all non - integral values of x

Answer: D

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325. If $f(x) = \begin{cases} \frac{\log_e x}{x-1} & x \neq 1 \\ k & x = 1 \end{cases}$ is continuous at x = 1 , then the value of k is

A. 0

B. (-1)

C. 1

D. e

Answer: C

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326. $f(x) = 2a - x$ in $-a < x < a = 3x - 2a$ in $a \leq x$. Then which of the following is true ?

A. f(x) is not differentiable at x = a

B. f(x) is discontinuous at x = a

C. f(x) is continuous at all a$x < a$

D. f(x) is differentiable at all $x \geq a$

Answer: A

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327. Which of the following function is differentiable at $x = 0$?

A. cos (|x|) + |x|

B. cos (|x|)-|x|

C. sin (|x|)+|x|

D. sin(|x|)-|x|

Answer: D

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328. Let $f(x) = \frac{1 - \tan x}{4x - \pi}, x \neq \frac{\pi}{4}, x \in \left[0, \frac{\pi}{2}\right]$, if f(x) is continuous in $\left[0, \frac{\pi}{4}\right]$, then $f\left(\frac{\pi}{4}\right)$ is :

A. 1

B. (1/2)

C. (-1/2)

D. 1

Answer: C

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329. The function $f: R/\{0\} \to R$ given by :

$f(x) = \frac{1}{x} - \frac{2}{e^{2x} - 1}$ can be made continuous at x = 0 by defining f(0) as :

A. 0

B. 1

C. 2

D. (-1)

Answer: B

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330. If $f: R \to R$ is defined by $f(x) = \begin{cases} \frac{\cos 3x - \cos x}{x^2} & x \neq 0 \\ \lambda & x = 0 \end{cases}$ and if f is continuous at x = 0 then λ is equal to

A. (-2)

B. (-4)

C. (-6)

D. (-8)

Answer: B

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331.

$$f(x) = \frac{\sqrt{1+px} - \sqrt{1-px}}{x}, \ -1 \leq x \leq 0 = \frac{2x+1}{x-2}, 0 \leq x \leq 1$$

is continuous in the interval [-1, 1], then p is :

A. (-1)

B. (-1/2)

C. (1/2)

D. 1

Answer: B

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332. Let

$$f(x) = \left\{ \frac{x^4 - 5x^2 + 4}{|(x-1)(x-2)|} x \neq 1, 2 \right), (6, x = 1), (12, x = 2) :\} .$$

Then, f(x) is continuous on the set

A. A. R

B. B. R-{1}

C. C. R-{2}

D. D. R- {1,2}

Answer: D

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333. Let $f(x) = \frac{1 - \sin x}{(\pi - 2x)^2}$, where $x \neq \pi/2$ and $f(\pi/2) = k$.

The value of k which makes f continuous at $\pi/2$ is :

A. (1/8)

B. (1/4)

C. (1/2)

D. none of these

Answer: A

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334. The value of f(0) so that the function $f(x) = \frac{(27-2x)^{\frac{1}{3}} - 3}{9 - 3(243+5x)^{\frac{1}{5}}}, x \neq 0$ is continuous, is given by

A. (2/3)

B. 6

C. 2

D. 4

Answer: C

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335. Let $f(x) = \begin{cases} \frac{\tan x - \cot x}{x - \frac{\pi}{4}} & x \neq \frac{\pi}{4} \\ a & x = \frac{\pi}{4} \end{cases}$. The value of 'a' so that f(x) is continuous at $x = \frac{\pi}{4}$ is

A. 2

B. 4

C. 3

D. 1

Answer: B

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336. The value of f(0), so that the function $f(x) = \frac{\sqrt{a^2 - ax + x^2} - \sqrt{a^2 + ax + x^2}}{\sqrt{a + x} - \sqrt{a - x}}$ becomes continuous for all x, given by

A. $a^{\frac{3}{2}}$

B. $a^{\frac{1}{2}}$

C. $-a^{\frac{1}{2}}$

D. $-a^{\frac{3}{2}}$

Answer: C

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337. The function $f(x) = 1 + |\sin x|$ is :

A. continuous no where

B. continuous every where and not differentiable at infinity many points

C. differentiable no where

D. differentiable at x = 0

Answer: B

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338. The range of the function $f(x) = [x] - x$, where [x] denotes the greatest integer $\leq$ x is :

A. {-1,0,1,2,3}

B. {-1,0,2}

C. {0,1,2,3}

D. {-1,0,1,2}

Answer: C

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339. Let $f\left(\frac{x+y}{2}\right) = \frac{f(x)+f(y)}{2}$ for all real values of x and y. If $f'(0)$ exists and equals -1 and f(0) =1, then $f'(2)$ is equal to

A. (-1)

B. 1

C. 0

D. none of these

Answer: A

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340. Let $f: R \to R$ be a function defined by $f(x) = \max\{x, x^3\}$.

The set of all points where f(x) is not differentiable is

A. {-1,1}

B. {-1,0}

C. {0,1}

D. {-1,0,1}

Answer: D

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341. The domain of the derivative of the function $f(x) = \begin{cases} \tan^{-1} x & |x| \leq 1 \\ \frac{1}{2}(|x| - 1) & |x| > 1 \end{cases}$ is

A. R-{0}

B. R-{1}

C. R-{-1}

D. R-{-1,1}

Answer: D

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342. $\lim_{h \to 0} \frac{f(2h+2+h^2)-f(2)}{f(h-h^2+1)-f(1)}$ given that $f'(2)=6$, and $f'(1)=4$

A. does not exist

B. is equal to -3/2

C. is equal to 3/2

D. is equal to 3

Answer: D

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343. If f(x) is differentiable increasing function, then $\lim_{x \to 0} \frac{f(x^2) - f(x)}{f(x) - f(0)}$ equals :

A. 1

B. 0

C. (-1)

D. 2

Answer: C

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344. If f(x) is continuos and differentiable function such that f(1/n) = 0 for all $n \in N$, then

A. f(x) = 0 for all `x in N cup (0,1]

B. f(0) = 0, $f'(0) = 0$

C. $f'(0) = 0$, f^('')(0) = 0`

D. f(0) and $f'(0)$ may or may not be zero

Answer: B

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345. Let f(x+y) = f(x).f(y), $\forall, x, y$. Suppose f(5) =2, $f'(0) = 3$ then $f'(5) =$

A. 6

B. 3

C. 5

D. none of these

Answer: A

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346. If $f(x) = \begin{cases} x-5 & x \leq 1 \\ 4x^2-9 & 1 < x < 2 \\ 3x+4 & x \geq 2 \end{cases}$ then $f'\left(2^+\right) =$

A. 0

B. 2

C. 3

D. 4

Answer: C

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347. If f(2) = 4 and $f'(2) = 1$ then $\lim_{x \to 2} \frac{xf(2) - 2f(x)}{x-2}$

A. 2

B. 4

C. (-2)

D. 1

Answer: A

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348. If f(x+y) = 2f(x) f(y) for all x,y where $f'(0) = 3$ and f(4) =2, then $f'(4)$ is equal to

A. 6

B. 12

C. 4

D. none of these

Answer: B

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349. If x+4|y| = 6y, then y as a function of x is

A. continuous at x =0

B. derivable at x =0

C. dy/dx = 1/2 for all x

D. none of these

Answer: A

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350. If $f(x+y)=f(x)f(y)$ and $f(x)=1+\mathrm{xg(x)}\ \mathrm{G(x)}$, where $\lim_{x\to 0} g(x)=a$ and $\lim_{x\to 0} G(x)=b$. Then $f'(x)$ is equal to :

A. 1+ab

B. ab

C. a/b

D. none of these

Answer: D

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351. The function $f(x) = x^3 - 3x$ is :

A. continuous at x =1

B. derivable at x =1

C. continuous at x =3

D. derivable at x = 3

Answer: D

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352. Let $f(x) = x\left(x - \sqrt{x+1}\right)$. Then :

A. f is continuous but not differentiable at x =0

B. f is differentiable at x =0

C. f is differentiable but not continuous at x =0

D. f is not differentiable at x =0

Answer: B

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353. It is given that $f'(a)$ exists, then $\lim_{x \to a} \frac{xf(a) - af(x)}{x - a}$ is equal to

A. $f(a) - af'(a)$

B. $f'(a)$

C. $-f'(a)$

D. $f(a)+af'(a)$

Answer: A

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354. Let $f(x+y)=f(x)f(y)$ and $f(x)=1+(\sin 2x)g(x)$, where $g(x)$ is continuous. Then $f'(x)$ is equal to :

A. f(x)g(0)

B. 2f(x)g(0)

C. 2g(0)

D. none of these

Answer: B

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