DEEP SCHOOL OF ECONOMICS

D.S.E.

Assignment For Calculus - I

1. $\lim_{x \to 0} \left(\frac{\sin x - x}{x^3} \right)$ equals

   a. 1/3 b. 1/6
   c. -1/3 d. -1/6

2. The limit of $\left(\frac{1 - \cos px}{1 - \cos qx} \right)$ as $x \to 0$ is

   a. *p/q* b. *q/p*
   c. p^2 / q^2 d. q^2 / p^2

3. The limit of $(\cot \alpha x) / (\cot \beta x)$ as $x \to 0$ is equal to

   a. 0 b. 1
   c. α / β d. β / α

4. $\lim_{x \to \infty} = \left(\frac{3^{5x} - 5^{3x}}{x} \right)$ equals

   a. 0 b. In $\left(\frac{243}{125} \right)$
   c. In $\left(\frac{3}{5} \right)$ d. In $\left(\frac{9}{25} \right)$

5. $\lim_{x \to \infty} = \left[x \tan \left(\frac{\pi}{3x} \right) \right]$ equals

   a. 0 b. $\frac{\pi}{2}$
   c. 3 d. $\frac{3}{\pi}$

6. If α is a repeated root of $ax^2 + bx + c = 0$ then $\lim_{x \to \alpha} = \left\{ \frac{\sin(ax^2 + bx + c)}{(x - \alpha)^2} \right\}$ is equals to

   a. 0 b. *a*
   c. *b* d. *c*

7. $\lim_{x \to 1} \left\{ \frac{ax^2 + bx + c}{(x-1)^2} \right\} = 2$, then *(a; b; c)* is

   a. (2; -2; 2) b. (2; -4; 2)
   c. (2; 2; 2) d. (2; 4; -2)

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

   a. 1 b. -1
   c. π d. $-\pi$

9. $\lim_{x \to a} \left\{ \frac{x^a - a^x}{x^x - a^a} \right\}$ is equal to

   a. $\left(\frac{1 + \ln a}{1 - \ln a} \right)$ b. $\left(\frac{1 - \ln a}{1 + \ln a} \right)$
   c. $\left(\frac{-1 + \ln a}{1 + \ln a} \right)$ d. $\left(\frac{1 - \ln a}{2 + \ln a} \right)$

10. $\lim_{x \to 0} \left[\cos ec^2 x - x^{-2} \right]$ equals

   a. $\frac{1}{3}$ b. $\frac{1}{6}$
   c. $\frac{1}{4}$ d. None of these

11. The limit of $\left\{ \frac{(a+h)^2 \sin(a+h) - a^2}{h} \right\}$ as $h \to 0,$ is equal to

   a. $a \cos a + a^2 \sin a$
   b. $a \sin a + a^2 \cos a$
   c. $2a \cos a + a^2 \sin a$
   d. $2a \sin a + a^2 \cos a$

12. If *f(9) =9* , *f '(9) = 4,* them $\lim_{x \to 9} \left(\frac{\sqrt{f(x)} - 3}{\sqrt{x} - 3} \right)$ equals

   a. 1 b. 4
   c. 9 d. None of these

13. $\lim_{x \to \alpha} \tan \left(\frac{\pi x}{2\alpha} \right) \sin \left(\frac{x - \alpha}{2} \right)$ equals

a. $-\left(\frac{\alpha}{\pi}\right)$ b. $-\left(\frac{\alpha}{2\pi}\right)$

c. $-\left(\frac{\alpha}{4\pi}\right)$ d. $-\left(\frac{4\alpha}{\pi}\right)$

14. $\lim_{x\to 1}\left\{\sec\left(\frac{\pi}{2x}\right)\text{In } x\right\}$ equals

a. $-\frac{2}{\pi}$ b. $-\frac{\pi}{2}$

c. $\frac{2}{\pi}$ d. $\frac{\pi}{2}$

15. Let $f(x)$ be a function defined by $f(x)=\frac{(1+\cos\pi x)}{(\tan^2\pi x)}, 1/2<x<3/2,$ then the limit of $f(x)$ as $x\to 1,$ is

a. -1/2 b. 0

c. 1/2 d. None of these

16. $\lim_{x\to\pi/4}(\tan x)^{\tan 2x}$ equals

a. -1 b. 0

c. e^{-1} d. e

17. $\lim_{x\to\infty}\left(\frac{x+a}{x-a}\right)^x=e$ if a equals

a. 1 b. -1

c. $\frac{1}{2}$ d. $-\frac{1}{2}$

18. $\lim_{x\to\infty}\left(\frac{x-1}{x+1}\right)^x$ equals

a. e b. e^{-1}

c. e^2 d. e^{-2}

19. $\lim_{m\to\infty}\left[\cos\left(\frac{x}{m}\right)\right]^m$ is equal to

a. 0 b. e

c. 1/e d. 1

20. $\lim_{x\to\infty}\text{In}\left(\frac{x+5}{x}\right)^x$ equals

a. 5 b. log5

c. e^5 d. none of these

21. $\lim_{x\to 0}\left(\frac{1-\tan x}{1+\tan x}\right)^{\text{cosec } x}$ equals

a. 1 b. e

c. e^{-1} d. e^{-2}

22. $\lim_{x\to\pi/2}(\sin x)^{\tan x}$ equals

a. 1 b. 0

c. e d. 1/e

23. The number of points at which the function $f(x)=(\log|x|)^{-1}$ is discontinuous, is

a. one b. two

c. three d. infinitely many

24. Let $f(x)=(x^3+1)/(x^2-1)$ be continuous at x = - 1, then f(- 1) must be taken as

a. - 2 b. - 3/2

c. - 1 d. - 1/2

25. The value of b for which the function $f(x)=\begin{cases} x+1, & if\ x\le 1 \\ 3-bx^2, & if\ x>1\end{cases}$ is continuous at x = 1, is

a. - 3 b. - 1

c. 0 d. 1

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

a. - 1 b. 0

c. 1 d. 13/3

27. If the function

$$f(x)=\begin{cases} -1, & for\ x\le 0 \\ ax+b, & for\ 0<x<1 \\ 1, & for\ x\ge 1\end{cases}$$

is continuous $\forall X\in\mathbb{R}$ then a and b are given by

a. a = - 1 and b = 1

b. a = 1 and b = 1

c. a = - 2 and b = - 1

d. a = 2 and b = - 1

28. The function $f(x)=\begin{cases}\sin\left(\frac{1}{x}\right), & x\neq 0\\ k, & x=0\end{cases}$ is continous at $x=0$ for

a. $k=0$ b. $k=1$
c. $k=-1$ d. no value of k

29. Let $f(x)=x^{1/(x-1)}$ for all positive $x\neq 1$. If f is continuous at $x=1$ then $f(1)$ to be equals to

a. 0 b. 1
c. e d. 1/e

30. Let $f:\mathbb{R}\to\mathbb{R}$ be defined by $f(x)=\begin{cases}1 & if\ x\,is\,irrational\\ 0 & if\ x\,is\,rational\end{cases}$. Then, f is continuous at

a. all rational points
b. all irrational points
c. all real points
d. no real points

31. If $f(x)=\begin{cases}0, & 0\le x\le \frac{1}{2}\\ 1, & \frac{1}{2}<x\le 1\end{cases}$ and

$g(x)=\begin{cases}1, & 0\le x\le \frac{1}{2}\\ 0, & \frac{1}{2}<x\le 1\end{cases}$

then the functions that is continuous on [0, 1] is

a. f b. g
c. f - g d. f + g

32. Let $f(x)=\begin{cases}\frac{1}{2}x-1, & 0\le x<1\\ \frac{1}{2}, & 1\le x<\infty\end{cases}$ and

g(x) = (2x + 1) (x - k) + 3, $0\le x<\infty$, then g{f(x)} is continuous at x = 1, if k equals

a. 1/2 b. 1/3
c. 11/6 d. 13/6

33. Let $f(x)=x-|x-x^2|, x\in[-1,1]$. The number of points of discontinuities of this function on [-1, 1] is

a. nil b. one
c. two d. three

34. If [.] denotes the greatest integer function, then the function $f(x)=[x]-[x-1]$ is continuous for

a. x = 0 and x = 1 only
b. all integral values of x
c. all real values of x
d. no real values of x

35. Let $f(x)=\begin{cases}\frac{\cos^2(\pi x)}{e^{2x}-2xe}; & x\neq \frac{1}{2}\\ \text{k}; & x=\frac{1}{2}\end{cases}$ The value of k for which $f(x)$ is continuous at $x=\frac{1}{2}$, is

a. $\frac{\pi}{2e}$ b. $\frac{\pi}{2e^2}$
c. $\frac{\pi^2}{2e}$ d. $\frac{\pi^2}{2e^2}$

36. The function $f(x)$ = |sin x| is continuous for all real x but not differentiable at

a. x = 0 only
b. $x=\pi$ only
c. all integral points only
d. all real points of the type $x=n\pi, n\in\mathbb{Z}$

37. The number of points at which the fuction $f(x)$ = |x - 0.5| + |x - 1| + tan x does not have a derivative in the intervfal (0, 2) is

a. 1 b. 2
c. 3 d. 4

38. If the function $f(x)=\begin{cases}px^2+1, & x\le 1\\ x+p, & x>1\end{cases}$ is differentiable $\forall x\in\mathbb{R}$ then p equals

a. 1/2 b. 1
c. 3/2 d. 2

39. Of the following functions, the only one that is differentiable at $x = 0$, is

a. $\cos|x|+|x|$ b. $\sin|x|+|x|$

c. $\cos|x|-|x|$ d. $\sin|x|-|x|$

40. Let $f:\mathbb{R}\to\mathbb{R}$ be any function. Define a funciton $g:\mathbb{R}\to\mathbb{R}$ by $g(x)=|f(x)|, \forall x\in\mathbb{R}$. Then, g is

a. one-one if f is one-one
b. onto if f is onto
c. continuous if f is continuous
d. differentiable if f is differentiable.

41. If $f(x)$ = min $\{1, x^2, x^3\}$, then $f'(1)$ is

a. 0 b. 2
c. 3 d. non-existent

42. Let $f(x)=\begin{cases} x^2 \; if \; x\le 1 \\ ax+b, if \; x>1, \end{cases}$ where a, b are constants. The value of a and b for which this function is differentiable at all real points are given by

a. $a = 1$ and $b = -1$
b. $a = 1$ and $b = 1$
c. $a = 2$ and $b = -1$
d. $a = -2$ and $b = 1$

43. The function $f(x)=\begin{cases} 1+x, & x\le 2 \\ 5-x, & x>2 \end{cases}$ is

a. discontinuous at $x = 2$
b. differentiable at $x = 2$
c. continuous but not differentiable at $x = 2$
d. none of these

44. The correct statement of the function $f(x)=e^{-|x|}$ is:

a. It is continuous and differentiable at $x = 0$
b. It is neither continuous nor differentiable at $x = 0$
c. It is continuous but not differentiable at $x = 0$
d. It is discontinuous but differentiable at $x = 0$

45. Let

$$f(x)=\begin{cases} (x-1)\sin\left(\frac{1}{x-1}\right), & if \; x\ne 1 \\ 0, & if \; x=1 \end{cases}$$

Then, the correct statement about f is:

a. f is differentiable at $x = 1$ but not at $x = 0$
b. f is differentiable at $x = 0$ but not at $x = 1$
c. f differentiable at $x = 0$ and at $x = 1$
d. f is differentiable neither at $x = 0$ nor at $x = 1$

46. The set of all points at which the function $f(x)=||x|-1|$ is not differentiable, is

a. {0} b. {1}
c. {1, -1} d. {0, 1, - 1}

47. If $f(x)=|x^2-x|$, then $f'(2)$ is equal to

a. 0 b. 3
c. -3 d. non-existent

48. If $f(x)=\frac{x}{(1+|x|)}, \forall x\in\mathbb{R}$ then $f'(0)$ is

a. 0 b. 1
c. $\frac{1}{2}$ d. non-existent

49. The derivative of $f(x)=|x-1|+|x-3|$ at $x=2$ is

a. 0 b. 1
c. 2 d. non-existent

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

51. If sin $(x + y)$ = In $(x + y)$, then $\frac{dy}{dx}$ is equal to

a. tan $(x + y)$
b. $(x + y)$ cos $(x + y)$
c. -1
d. 1

52. If $f(x) = \log_x (\ln x)$, the $f'(e)$ equals
a. 0 b. e
c. $1/e$ d. $2/e$

53. Let $f(x) = ax^2 + bx + c, a \neq 0$. If a, b, c are in A.P., then $f'(a), f'(b), f'(c)$ are in
a. A.P. b. G.P.
c. H.P. d. no defintie space

54. Let S be a set of P(x), where P(x) is a polynomial of degree ≤ 2 such that P(0) = 0, P(1) = 1 and $P'(x) > 0, \forall x \in [0,1]$, then the correct statement is
a. $S = \phi$;
b. $S = ax + (1-a)x^2; 0 < a < 1$
c. $S = ax + (1-a)x^2; 0 < a < 2$
d. $S = ax + (1-a)x^2; -\infty < a < \infty$

55. Let $f : \mathbb{R} \to \mathbb{R}$ be a function satisfying $|f(x) - f(y)| \leq (x - y)^2$ and $f(0) = 0$, then $f(1)$ equals
a. -1 b. 0
c. 1 d. 2

56. if $x_n = \dfrac{1-2+3-4+5-6+.........-2n}{\sqrt{(n^2+1)} \times \sqrt{(4n^2-1)}}$.
then $\lim_{n\to\infty} x_n$ equals
a. $\frac{1}{2}$ b. $\frac{1}{3}$
c. $\frac{-1}{2}$ d. $\frac{-1}{3}$

57. $\{x\}$ denotes the fractional part of a real no. x, then $\lim_{x\to 0}\left\{\dfrac{In(1+\{x\})}{\{x\}}\right\}$ is
a. 0 b. -1
c. 1 d. non-existent

58. If α, β are the roots of the equation $ax^2 + bx + c = 0$ then $\lim_{x\to\alpha}\left[1 + ax^2 + bx + c\right]^{1/(x-\alpha)}$ equals
a. $a(\alpha - \beta)$ b. $\ln|a(\alpha - \beta)|$
c. $e^{a(\alpha - \beta)}$ d. $e^{a\alpha - \beta}$

59. If $\lim_{x\to\infty}\left(1 + \dfrac{a}{x} + \dfrac{b}{x^2}\right)^{2x} = e^2$ then a and b are given by
a. $a = 1, b = 2$
b. $a = 2, b = 1$
c. $a \in \mathbb{R}, b = 2$
d. $a = 1, b \in \mathbb{R}$

60. $\lim_{x\to 0}\lim_{n\to\infty}\left\{\dfrac{\sin x + \sin^2 x + ... + \sin^n x}{x}\right\}$ is
a. 0 b. 1
c. -1 d. non-existent

61. For $x > 0$, $\lim_{x\to 0}\left\{(\cos x)^{1/x} + \left(\dfrac{1}{x}\right)^{\sin x}\right\}$ is
a. 0 b. -1
c. 1 d. 2

62. If $[x]$ denotes the greatest integer less then or equal to x, and $f(x) = [x] + [-x]$, then $\lim_{x\to 0} f(x)$ is
a. 0 b. -1
c. -2 d. non-existent

63. $\lim_{x\to 0}\left[\dfrac{\left(\sum_{i=2}^{2009} i^x\right) - 2008}{x}\right]$ equals
a. In (2009) b. 2009!
c. In 2009! d. none of these

64. $y = f\left(\dfrac{2x}{1+x^2}\right)$ and $f'(x) = \sin x$, then $\dfrac{dy}{dx}$ equals
a. $\sin x$
b. $\left(\dfrac{2x}{1+x^2}\right) \sin x$
c. $\dfrac{2}{1+x^2}\sin\left(\dfrac{2x}{1+x^2}\right)$

d. $2\left[\frac{(1-x^2)}{(1+x^2)^2}\right]\sin\left(\frac{2x}{1+x^2}\right)$

65. If $x\{f(x)\}^3 + x\{f(x)\} = 6,$
$f(3)\} = 1,$ then $f'(3)$ is equal to

a. -1 b. -1/2
c. -1/4 d. -1/6

66. Let f and g be two differentiable functions satisfying $g'(a) = 2, g(a) = b$ and $(fog) \equiv I,$ where I is the identity function. Then, $f'(b)$ is equal to

a. 0 b. 1/2
c. 2/3 d. 2

67. If *g(x)* is a differentiable funciton such that $g(0) = g(1) = 0, g'(1) = 1$
and $y(x) = g(e^x).e^{g(x)}$ then $y'(0)$ equals

a. 0 b. 1
c. 2 d. e

68. If $f(x) = |x-2|,$ and $g(x) = f\{f(x)\},$ then for $x \geq 2,$ $g'(x)$ equals

a. 0 b. 1
c. -1 d. non of these

69. The derivative of $F\left[f\{\phi(x)\}\right]$ is

a. $F'\left[f'\{\phi'(x)\}\right]$

b. $F'\left[f'\{\phi(x)\}\right]f'\{\phi(x)\}$

c. $F'\left[f\{\phi'(x)\}f'\{\phi(x)\}\right]$

d. $F'\left[f\{\phi(x)\}\right]f'\{\phi(x)\}\phi'(x)$

70. If $f(x) = x^2 - |x-2|,$ then $f'(2)$ is

a. equal to 0 b. equal to 3
c. equal to 4 d. non-existent

71. If $f(x) = \begin{cases} 1, & for\ x < 0 \\ 1+\sin x, & for\ 0 \leq x < \pi/2 \end{cases}$

then $f'(0)$ is

a. 0 b. 1
c. -1 d. non-existent

72. The derivative of sin[sin(sin*x*)] w.r.t. *x* is

a. $3\sin^2 x\cos x$
b. cos[cos(sinx)]×cosx
c. $\cos[\cos(\sin x)]\times\cos(\sin x)$
d. $\cos[\sin(\sin x)]\times\cos(\sin x)\times\cos x$

73. If $f(1) = 3, f'(1) = 2,$ then at the point $x = 0,$ $\frac{d}{dx}\{\text{In } f(e^x + 2x)\}$ is equal to

a. $\frac{2}{3}$ b. $\frac{3}{2}$
c. 2 d. 3

74. For $y = \left(\frac{a+bx^{3/2}}{x^{5/4}}\right),$ if $y' = 0$ at $x = 5,$ then $a : b$ is equal to

a. 3 : 5 b. 5 : 2
c. $\sqrt{5}:1$ d. 6 : 5

75. If $f'(x) = \frac{d}{dx}f(x),$ then the relationship $f'(a+b) = f'(a) + f'(b)$ s valid if *f(x)* is equal to

a. x b. x^2
c. x^3 d. x^4

76. For a constant *a*, if sec $\left(\frac{x+y}{x-y}\right) = a$ then, $\frac{dy}{dx}$ equals

a. $\left(\frac{x}{y}\right)$ b. $\left(\frac{y}{x}\right)$
c. $\left(\frac{x}{a}\right)$ d. 1

77. If $x = 1 + f(t), y = \frac{1-f(t)}{1+f(t)},$ then $\frac{dy}{dx}$ in terms of f and f' is equal to

a. $-(1+f)^2/2f'$
b. $-(1+f)^2/2$

c. $-2/(1+f)^2$

d. $-2f'/(1+f)^2$

78. A curve is defined by $\begin{cases} x = e^t \cos t \\ y = e^t \sin t \end{cases}$. The angle that the tangent to the curve at the point $t = \pi/4$ makes with the *x*-axis, is

a. 0 b. $\frac{\pi}{2}$

c. $\frac{\pi}{3}$ d. $\frac{\pi}{4}$

79. The rate of change of $\sqrt{(x^2+16)}\ w.r.t. \frac{x}{(x-1)}$ at $x = 3$, is

a. 2 b. $2\frac{1}{5}$

c. $-\frac{12}{5}$ d. -3

80. The derivative of $\sin^2 x\ w.r.t. \cos^2 x$ is

a. $\tan^2 x$ b. $\tan x$

c. $-\tan x$ d. -1

81. The derivative of $\log_{10} x\ w.r.t. \log_x 10$ is

a. $\frac{1}{x(\text{In}10)}$ b. $-\frac{\text{In}\,10}{x(\text{In}\,x)^2}$

c. $-\frac{(\text{In}\,x)^2}{(\text{In}10)^2}$ d. $\frac{(\text{In}\,x)^2}{(\text{In}10)^2}$

82. If $f(x) = \max\{(1-x), (1+x), 2\}, \forall x \in \mathbb{R}$, then $f'(2)$ equals

a. -1 b. 0

c. 1 d. 2

83. If $f(x) = \log_{x^2}(\text{In}\,x)$, $f'(e)$ is equal to

a. 0 b. $1/2e$

c. $e/2$ d. $2/e$

84. If $\phi(x) = \log_5(\log_3 x)$, then $\phi'(e)$ equals

a. 1 b. $(\log_5 e)$

c. $\frac{1}{e}(\log_5 e)$ d. $e(\log_5 e)$

87. If $f(x) = (x-2)(x-4)(x-6)$ ....$(x-2n)$, then $f'(2)$ is

a. $(-1)^n \times 2^{n-1}(n-1)!$

b. $(-1)^n \times 2^n (n-1)!$

c. $(-1)^{n-1} \times 2^{n-1}(n-1)!$

d. non-existent

88. Let $F(x) = f(x)g(x)h(x) \forall x \in \mathbb{R}$, where *f(x)*,*g(x)* and *h(x)* are differentiable functions at some point x_0.

$F'(x_0) = 21F(x_0)$;

$f'(x_0) = 4f(x_0)$; $g'(x_0) = -7g(x_0)$;

and $h'(x_0) = kh(x_0)$, then *k* equals

a. 18 b. 24

c. 51 d. 63

89. If $5f(x) + 3f(1/x) = x + 2$ and $y = xf(x)$, then $\left(\frac{dy}{dx}\right)_{x=1}$ is equal to

a. -1 b. 1

c. $\frac{8}{7}$ d. $\frac{7}{8}$

90. Let $f(x+y) = f(x) \times f(y), \forall x, y \in \mathbb{R}$. If $f(6) = 3$, $f'(0) = 10$, then $f'(6)$ is equal to

a. 6 b. 10

c. 30 d. 36

91. Let $f: \mathbb{R} \to \mathbb{R}$ be a diferentiable function satisfying

$f(y) \times f(x-y) = f(x), \forall x, y \in \mathbb{R}$.

If $f'(0) = p$, $f'(5) = q$ then $f'(-5)$ equals

a. -q/p b. p/q

c. p^2/q d. q^2/p

92. Let $f: \mathbb{R} \to \mathbb{R}$ be defined by $f(x+y+z) = f(x) \cdot f(y) \cdot f(z)$ $\forall\, x, y, z \in \mathbb{R}$.

If $f(0) \neq 0, f(2) = 4, f'(0) = 5,$ then $f'(2)$ equals

a. ± 20 b. ± 30

c. ± 80 d. ± 100

93. If $f(x) = 1 + x + e^x$, then $(f^{-1})'(2)$ equals

a. $\frac{1}{4}$ b. $\frac{1}{2}$

c. 1 d. 2

94. Suppose g is the inverse funciton of a differentiable funciton f and $G(x) = \frac{1}{g(x)}$.

If $f(3) = 2$ and $f'(3) = \frac{1}{9}$, then $G'(2)$ equals.

a. -1 b. 1

c. 3 d. 9

95. If f is a one-to-one twice differentiable function with the inverse function g, then $g''(x)$ equals

a. $\frac{1}{f''(g(x))}$ b. $-\frac{1}{\{f''(g(x))\}^2}$

c. $-\frac{f''\{g(x)\}}{\{f'(g(x))\}^2}$ d. $-\frac{f''(g(x))}{\{f'(g(x))\}^3}$

96. Let $f; (-1,1) \to \mathbb{R}$ such that

$$e^{-x} f(x) = 2 + \int_0^x \sqrt{(t^4+1)}dt, \forall x \in (-1,1)$$

Let f^{-1} be the inverse function of f, then $(f^{-1})'(2)$ is equal to

a. 1 b. $\frac{1}{2}$

c. $\frac{1}{3}$ d. $\frac{1}{e}$

97. If $f'(x)$ denotes the derivative of differentiable funciton $f(x)$, then

$$\lim_{h \to 0}\left\{\frac{[f(a+h)]^2 - [f(x)]^2}{h}\right\}$$ equals

a. $[f'(x)]^2$

b. $\frac{1}{2}[f'(x)]^2$

c. $f(x) \times f'(x)$

d. $2f(x) \times f'(x)$

98. The set of points where the function $f(x) = x|x|$ is twice differentiable, is

a. ϕ

b. $\mathbb{R} - \{0\}$

c. $\mathbb{R} - \{-1, 0, 1\}$

d. $\mathbb{R}$

99. Let $f : \mathbb{R} \to \mathbb{R}$ be a positive increasing funciton such that $\lim_{x \to \infty}\left\{\frac{f(3x)}{f(x)}\right\} = 1$, then $\lim_{x \to \infty}\left\{\frac{f(2x)}{f(x)}\right\}$ equals

a. $\frac{2}{3}$ b. $\frac{3}{2}$

c. $\frac{1}{2}$ d. 1

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