Lecture-1

1. The point $P(2,-1)$ lies on the curve $y=\frac{1}{1-x}$.

If Q is the point $Q(x,\frac{1}{1-x})$, then the slope of the secant line PQ (correct to six decimal places) for of x = 2.1 is

i) 0.909, ii) 2 , iii) 1.23, iv) none of these

2. For the above question find the slope for x= 2.5 is

i) 0 .843, ii) 0.66 , iii) 1.23, iv) none of these

3. For the above question find the slope for x= 2.001 is

i) 0 .63, ii) 0.899 , iii) 0.99, iv) none of these

2. The table shows the position of a cyclist.

x	0	1	2	3
y	0	1.4	5.1	10.7

i) The average velocity for the time period $[1,3]$ is

a) $4.65m/s$, b) $4.95m/s$, c) $3.95m/s$, iv) none of these

ii) The average velocity for the time period $[2,3]$.

a) $6.1m/s$, b) $7.2m/s$, c) $5.6m/s$, iv) none of these

1. i, 2. ii, 3. iii, 4. i, 5. iii

Lecture -4

1) If P is a polynomial, then $\lim_{x\to b} P(x) = P(b)$ for this statement mention which one is correct.
   (a) True
   (b) False
   (c) Neither true nor False
   (d) None of these

2) If f is continuous at 5 and $f(5) = 2$ and $f(4) = 3$, then $\lim_{x\to 2} f(4x^2 - 2)$ is.
   (a) 4
   (b) 2
   (c) 3
   (d) None of these

3) Find the domain of the function $f(x) = \dfrac{x^2 - x - 2}{x - 2}$
   (a) All Real number
   (b) $(-\infty, \infty)$
   (c) $\{x/x \neq 2\}$
   (d) None of these

4) Find $\lim_{x\to 2} \dfrac{x^2 - x - 2}{x - 2}$
   (a) 1
   (b) 2
   (c) 3
   (d) ∞

5) If $\lim_{x\to 2^+} f(x) = 4$, $\lim_{x\to 2^-} f(x) = 7$ $f(x) = 3$ Then
   (a) $f(x)$ is continuous at 2^+
   (b) $f(x)$ is discontinuous at 2^-
   (c) $f(x)$ is continuous at 2
   (d) $f(x)$ is discontinuous at 2

Answers:

1.(a), 2. (b), 3. (c), 4. (c), 5. (d)

Lecture -5

1) Find $\lim_{x\to\infty}\frac{x^2-1}{x^2+1}$
   (a) ∞
   (b) 0
   (c) Not define
   (d) 1

2) Find $\lim_{x\to\infty}\left(x^2-x\right)$
   (a) ∞
   (b) $-\infty$
   (c) 0
   (d) None of these

3) Evaluate $\lim_{x\to 2^+} \; arc \; tan\left(\frac{1}{x-2}\right)$
   (a) $-\frac{\pi}{2}$
   (b) $\frac{\pi}{2}$
   (c) 0
   (d) ∞

4) If either $\lim_{x\to\infty} f(x) = L \quad or \quad \lim_{x\to-\infty} f(x) L$ then the line $Y = L$ is called curve of
   (a) Horizontal asymptote
   (b) Vertical asymptote
   (c) Tangent
   (d) None of these,

5) Find $\lim_{x\to\infty}\frac{1-e^x}{1+2e^x}$
   (a) $\frac{1}{2}$
   (b) $-\frac{1}{2}$
   (c) 0
   (d) 1

Answers:

1.(d), 2. (a), 3. (b), 4. (a), 5. (b)

Lecture -6

1) Find the slope of the tangent line to the parabola $Y = 4x - x^2$ at the point $(1,3)$
   (a) 3
   (b) 2
   (c) 7
   (d) None of these

2) Determine equation of the above tangent line
   (a) $Y = 3x + 1$
   (b) $Y - 3x = 1$
   (c) $Y = 2x + 1$
   (d) None of these

3) If a ball is thrown into the air with a velocity of 10m/s, its height (in meter) after t seconds is given by $Y = 10t - 4.9t^2$. Fine the velocity when $t = 2$.
   (a) 9.6m/s
   (b) 9m/s
   (c) -9.6m/s
   (d) None of these

4) Find velocity when t = 5 for a particle which moves along a straight line with equation of motion $S = f(t)$, s is measured in meters and t in seconds where $f(t) = 100 + 50t - 4.9\,\mathrm{t}^2$
   (a) 1m/s
   (b) -1m/s
   (c) 3m/s
   (d) None of these

5) Find $f'(2)\ where\ f(x) = x^3 - 2x$
   (a) 12
   (b) 10
   (c) 4
   (d) 6

Answers:

1.(b), 2. (c), 3. (c), 4. (a), 5. (b)

Quiz-8

Q.1 Derivative of the constant function is _____ .

(a) constant (b) any function (c) zero (d) none of these

Q.2 The equation of motion of a particle is $s = t^3 - 3t$, where s is in meters and t is in seconds. Find the acceleration in m/sec^2 when the density is zero.

(a) 3 (b) 4 (c) 5 (d) 6

Q.3 What is the slope of the normal line to the curve $y = 2xe^x$ at (0,0)?

(a) 2 (b) -1/2 (c) 3 (d) -1/3

Q.4 If $f(x) = e^x g(x)$, where $g(0) = 2$ and $g'(0) = 5$, find $f'(0)$.

(a) 4 (b) 5 (c) 6 (d) 7

Q.5 For what values of x is the function $f(x) = |x^2 - 9|$ is differentiable?

(a) $(-\infty, -3)$ (b) $(3, \infty)$ (c) $R - \{-3, 3\}$ (d) $(-3, 3)$

Q.1 Ans. (c), **Q.2** Ans. (d), **Q.3** Ans. (b), **Q.4** Ans. (d), **Q.5** Ans. (c)

Quiz-9

Q.1 What is the derivative of $\text{Sin}^2 x$ w.r.t. Cos x for $x = 0$.

(a) 2 (b) -2 (c) 0 (d) 3

Q.2 Suppose $f\left(\frac{\pi}{3}\right) = 4$ and $f'\left(\frac{\pi}{3}\right) = -2$, and let $g(x) = f(x)\text{Sin}\, x$. Find $g'\left(\frac{\pi}{3}\right)$.

(a) $2-\sqrt{3}$ (b) $2+\sqrt{3}$ (c) $3+\sqrt{2}$ (d) $3-\sqrt{2}$

Q.3 For what values of x does the graph of $f(x) = e^x \text{Cos}\, x$ have a horizontal tangent.

(a) 1 (b) 2 (c) 0 (d) none of these

Q.4 If $f(x) = e^x Cosx$ then find $f''(0)$.

(a) 1 (b) -1 (c) 0 (d) 2

Q.5 If $f(x) = Cosx$ then find $f^{(24)}(0)$.

(a) 0 (b) 1 (c) -1 (d) 2

Q.1 Ans. (b), **Q.2** Ans. (a), **Q.3** Ans. (c), **Q.4** Ans. (c), **Q.5** Ans. (b)

Lecture : 10

1) If $F(x)=\sqrt{x^2+1}$, Then $F'(x)$ is

(a) $\dfrac{1}{\sqrt{x^2+1}}$

(b) $\dfrac{x}{\sqrt{x^2+1}}$

(c) $\dfrac{1}{\sqrt{x^2-1}}$

(d) $\dfrac{x}{\sqrt{x^2-1}}$

Q2: What is the derivative of 2^x ?

(a) 2^{x-1}

(b) $x2^{x-1}$

(c) $2^x \ln 2$

(d) $2^x \ln x$

Q3: If $y=\sqrt{x}$, Then y' is

(a) $\dfrac{1}{\sqrt{x}}$

(b) $\dfrac{x}{\sqrt{x^2+1}}$

(c) $\dfrac{1}{\sqrt{x^2-1}}$

(d) $\dfrac{x}{\sqrt{x^2-1}}$

Q4: The equation of tangent line to the curve $y=\sin(\cos x)$ at $(\pi,0)$ is

(a) $y=x+\pi$

(b) $y=x-\pi$

(c) $x=y+\pi$

(d) $x=y-\pi$

Q5: If n is any real number and u is differentiable then $\dfrac{d}{dx}\left[u^n\right]$ is

(a) nu^{n-1} (b) $nu^{n-1}\dfrac{du}{dx}$ (c) $\dfrac{1}{\sqrt{x^2-1}}$ (d) $\dfrac{x}{\sqrt{x^2-1}}$

Answers:

1.(b), 2. (c), 3. (d), 4. (a), 5. (b)

Lecture-11

1) What is the value of y' if $x^3 + y^3 = 6xy$?

(a) $\dfrac{3y + x^2}{y^2 - 2x}$

(b) $\dfrac{3y + x^2}{y^2 + 2x}$

(c) $\dfrac{2y - x^2}{y^2 - 2x}$

(d) $\dfrac{2y + x^2}{y^2 - 2x}$

2) The equation of tangent line to the curve $x^2 + xy + y^2 = 3$ at $(1,1)$ is

(a) $y = x + 2$

(b) $2y = x - 1$

(c) $x = y + 1$

(d) $y = 2 - x$

3) If $f(x) = \sin^{-1} x$, Then $f'(x)$ is

(a) $\dfrac{1}{\sqrt{1 - x^2}}$

(b) $\dfrac{x}{\sqrt{x^2 + 1}}$

(c) $\dfrac{1}{\sqrt{x^2 - 1}}$

(d) $\dfrac{x}{\sqrt{x^2 - 1}}$

4) What is the derivative of the function $y = \tan^{-1}\sqrt{x}$?

(a) $\dfrac{\sqrt{x}}{\sqrt{1-x^2}}$

(b) $\dfrac{x}{\sqrt{x^2+1}}$

(c) $\dfrac{1}{2\sqrt{x}(x+1)}$

(d) $\dfrac{x}{\sqrt{x^2-1}}$

5) Which point on the curve $x^2y^2 + xy = 2,$ where the slope of the tangent line is -1 ?

(a) $(-1,1)$

(b) $(-1,1)$

(c) $(-2,1)$

(d) $(1,1)$

Answers:

1.(c), 2. (d), 3. (a), 4. (c), 5. (d)

Lecture-12

1) The value of $\frac{d}{dx}\ln(\sin x)$ is

(a) $\frac{1}{\sin x}$

(b) $\cos x$

(c) $\cot x$

(d) $\sin x$

2) If $f(x) = \ln|x|$, What is the value of $f'(x)$?

(a) $\frac{1}{x}$

(b) x

(c) 1

(d) $\ln x$

3) The value of $\frac{d}{dx}(a^b)$ where a and b are constants.

(a) a^{b-1}

(b) 0

(c) b^{a-1}

(d) $\frac{2y + x^2}{y^2 - 2x}$

4) The domain of $f(x) = \sqrt{2 + \ln x}$ is

(a) $(-\infty, \infty)$

(b) $\left[e^{-1}, \infty\right)$

(c) $[e, \infty)$

(d) $[1, \infty)$

5) If $y = \ln(\ln x)$,Then y' is

(a) $\frac{1}{x}$

(b) $\ln x$

(c) $\frac{1}{x \ln x}$

(d) $\sin x$

Answers:

1.(c), 2. (a), 3. (b), 4. (b), 5. (c)

QUIZ-13

(1) If $f(t) = te^t$ describes the motion of the particle in plane then it's velocity at t=1 is

(a) e (b)2e (c)3e (d)4e

(2) In above case what is the acceleration of the particle at t=1.

(a) e (b)2e (c)3e (d)4e

(3) If a rock is thrown vertically upward and its height (in meter) after t second is $s(t) = 4t - 2t^2$. When will be the rock's velocity become zero?

(a) 1sec. (b)2sec. (c)3sec. (d)4sec.

(4) In above case what will be the maximum height travelled by the rock.

(a) 1meter (b)2meter (c)3meter (d)4meter

(5) In above problem, when will be the rock hit back the ground.

(a) 1sec. (b)2sec. (c)3sec. (d)4sec.

ANSWER TO QUIZ-13

(1)-(b), (2)-(c), (3)-(a), (4)-(b), (5)-(b)

Quiz questions of cal-I from chapter 4.2-4.4

Ques. 1: Identify the interval on which $f(x) = 2x^3 - 3x^2 - 12x$ is increasing

(a) $(1, 2)$

(b) $(-1, 2)$

(c) $(-\infty, 1) \cup (2, \infty)$

(d) $(-\infty, -1) \cup (2, \infty)$

Ques. 2: If $f(1) = 10$ and $f'(x) \geq 2$ for $1 \leq x \leq 4$ then find the smallest possible value of $f(4)$.

(a) 14

(b) 15

(c) 16

(d) 18

Ques. 3: Absolute maximum value of the function $f(x) = x^3 - 3x + 1$ in the interval $[0, 3]$ is

(a) -1

(b) 3

(c) 18

(d) 19

Ques. 4: The interval of concave upward is of the function $f(x) = x^2 \ln x$ is

(a) $(e^{\frac{1}{2}}, \infty)$

(b) $(e^{-\frac{3}{2}}, \infty)$

(c) $(e^{\frac{3}{2}}, \infty)$

(d) $(e^{\frac{-1}{2}}, \infty)$

Ques. 5: Find the local maximum and local minimum values for the function $h(x) = 5x^3 - 3x^5$.

(a) 2,-2 respectively

(b) 3, -3 respectively

(c) -3, 3 respectively

(d) -2, 2 respectively

Ques. 6: Find the local maximum and local minimum values for the function $f(x) = \sin x + \cos x$, $0 \le x \le 2\pi$

(a) $-\sqrt{2}$, $\sqrt{2}$ respectively

(b) $\sqrt{2}$, $-\sqrt{2}$ respectively

(c) $\sqrt{3}$, $-\sqrt{3}$ respectively

(d) $-\sqrt{3}$, $\sqrt{3}$ respectively

Ques. 7: If the function $f(x) = 2x^2 - 3x + 1$ satisfies the hypothesis of the mean value theorem on the interval $[0, 2]$ then find the number 'c' that satisfy the conclusion of the mean value theorem.

(a) 0

(b) 1

(c) -1

(d) 2

Ques. 8: If the function $f(x) = x^3 - x^2 - 6x + 2$ satisfies Rolle's theorem on the interval $[0, 3]$ then find the number 'c' that satisfy the conclusion of the Rolle's theorem

.

(a) $\frac{-1-\sqrt{19}}{3}$

(b) $\frac{-1+\sqrt{19}}{3}$

(c) $\frac{1\pm\sqrt{19}}{3}$

(d) $\frac{-1\pm\sqrt{19}}{3}$

Ques. 9: If the function $f(x) = e^{-2x}$ satisfies Mean value theorem on the interval $[0, 3]$ then find the number 'c' that satisfy the conclusion of the Mean value theorem.

(a) $-\frac{1}{2}\ln[\frac{1}{6}(1-e^{-6})]$

(b) $\frac{1}{2}\ln[\frac{1}{6}(1-e^{-6})]$

(c) $\frac{1}{2}\ln[\frac{1}{6}(1+e^{-6})]$

(d) $-\frac{1}{2}\ln[\frac{1}{6}(1+e^{-6})]$

Ques. 10: The value of $\lim_{x\to\infty} x\tan\frac{1}{x}$ is

(a) 1

(b) 0

(c) ∞

(d) -1

Ques. 11: The value of $\lim_{x\to\infty}\frac{(\ln x)^2}{x}$ is

(a) ∞

(b) 1

(c) 0

(d) -∞

Ques. 12: The value of $\lim_{x\to\frac{\pi}{2}^+}\frac{\cos x}{1-\sin x}$ is

(a) 0

(b) -∞

(c) ∞

(d) 1

Ques. 13: The value of $\lim_{x\to 1}(\frac{x}{x-1}-\frac{1}{\ln x})$ is

(a) 1

(b) 0

(c) $-\frac{1}{2}$

(d) $\frac{1}{2}$

Ques. 14: The value of $\lim_{x\to 0^+}(\cos x)^{\frac{1}{x^2}}$ is

(a) ∞

(b) 1

(c) -1

(d) 0

Ques. 15: Use L' Hospital rule to evaluate $\lim_{x\to\infty} x^3 e^{-x^2}$.

(a) 0

(b) 1

(c) -1

(d) ∞

Ques. 16: Use L' Hospital rule to evaluate $\lim_{x\to\infty} \frac{\ln \ln x}{x}$.

(a) 1

(b) -1

(c) 0

(d) ∞

Ques. 17: Use L' Hospital rule to evaluate $\lim_{t\to 0} \frac{e^{2t}-1}{\sin t}$.

(a) 0

(b) 1

(c) 2

(d) ∞

Ques. 18: Use L' Hospital rule to evaluate $\lim_{x\to\frac{\pi}{2}}(\sec x - \tan x)$.

(a) 0

(b) 1

(c) -1

(d) ∞

Ques. 19: The interval of concave downward is of the function $f(x) = x^2 \ln x$ is

(a) $(-\infty, e^{\frac{1}{2}})$

(b) $(-\infty, e^{-\frac{3}{2}})$

(c) $(-\infty, e^{\frac{3}{2}})$

(d) $(-\infty, e^{-\frac{1}{2}})$

Ques. 20: The critical numbers of the curve $y = x^4 - 4x^3$

(a) 0 and 4

(b) 0 and 2

(c) 0 and 1

(d) 0 and 3