

MTH101 Calculus And Analytical Geometry All Midterm Solved Papers In One File

Question No: 1 (Marks: 1) - Please choose one

The base of the natural logarithm is

▶ 2.71

▶ 10

▶ 5

▶ None of these

Question No: 2 (Marks: 1) - Please choose one

A line $x = x_0$ is called ----- for the graph of a function f if
 $f(x) \rightarrow +\infty$ or $f(x) \rightarrow -\infty$ as x approaches x_0 from the right or from the left

▶ Horizontal asymptotes

▶ None of these

▶ Vertical asymptotes

Question No: 3 (Marks: 1) - Please choose one

If a function satisfies the conditions

$f(c)$ is defined

$$\lim_{x \rightarrow c^+} f(x)$$

Exists

$$\lim_{x \rightarrow c^+} f(x) = f(c)$$

Then the function is said to be

▶ Continuous at c

▶ Continuous from left at c

▶ Continuous from right at c

▶ None of these

Question No: 4 (Marks: 1) - Please choose one

If $f''(x) < 0$ on an open interval (a,b) then f is ----- on (a,b)

- ▶ None of these
- ▶ Concave up
- ▶ Concave down
- ▶ Closed

Question No: 5 (Marks: 1) - Please choose one

Suppose that f and g are differentiable function of x then $\frac{d}{dx}\left(\frac{f}{g}\right)$

▶ $\frac{g \cdot f' - f \cdot g'}{g^2}$

▶ $\frac{g \cdot f' + f \cdot g'}{g^2}$

▶ $\frac{g \cdot f' - f \cdot g'}{g}$

- ▶ None of these

Question No: 6 (Marks: 1) - Please choose one

A line $x = x_0$ is called ----- for the graph of a function f if $f(x) \rightarrow +\infty$ or $f(x) \rightarrow -\infty$ as x approaches x_0 from the right or from the left

- ▶ Horizontal asymptotes
- ▶ None of these
- ▶ Vertical asymptotes

Question No: 7 (Marks: 1) - Please choose one

$$y = \frac{1}{1-x} \quad \frac{dy}{dx} =$$

then

- ▶ 1
- ▶ -1
- ▶ $\frac{1}{(1-x)^2}$
- ▶ $\frac{-1}{(1-x)^2}$

Question No: 8 (Marks: 1) - Please choose one

Suppose that f and g are differentiable functions of x then

$$\frac{d}{dx}[f][g] =$$

- ▶ $\frac{[f'] [g] - [f] [g']}{g^2}$
- ▶ $[f'] [g']$
- ▶ $[f'] [g] + [f] [g']$
- ▶ $[f'] [g] - [f] [g']$

Question No: 9 (Marks: 1) - Please choose one

$$\text{If } x^2 + y^2 = 9 \text{ then } \frac{dy}{dx} =$$

- ▶ $\frac{x}{y}$
- ▶ $\frac{-x}{y}$
- ▶ $\frac{-y}{x}$

$$\frac{y}{x}$$



Question No: 10 (Marks: 1) - Please choose one

If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) > 0$ then f has relative At x_0

- ▶ Minima
- ▶ Maxima
- ▶ None of these

Question No: 11 (Marks: 1) - Please choose one

If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) < 0$ then f has relative At x_0

- ▶ Minima
- ▶ Maxima
- ▶ None of these

Question No: 12 (Marks: 1) - Please choose one

If $f''(x) > 0$ on an open interval (a, b) , then which of the following statement is correct?

- ▶ f is concave up on (a, b) .
- ▶ f is concave down on (a, b) .
- ▶ f is linear on (a, b) .

Question No: 13 (Marks: 1) - Please choose one

Let $y = (x^3 + 2x)^{37}$. Which of the following is correct?

$$\frac{dy}{dx} = (37)(x^3 + 2x)^{36}$$



$$\frac{dy}{dx} = 111x^2(x^3 + 2x)^{36}$$



$$\frac{dy}{dx} = (111x^2 + 74)(x^3 + 2x)^{36}$$



$$\frac{dy}{dx} = (111x^2 + 74)(x^3 + 2x)^{38}$$



Question No: 14 (Marks: 1) - Please choose one

If $x > 0$ then $\frac{d}{dx}[\ln x] =$ _____

▶ $\frac{1}{x}$

▶ x

▶ $\frac{1}{x}$

▶ x

▶ $\ln \frac{1}{x}$

▶ $\ln \frac{1}{x}$

▶ $\ln \frac{1}{x}$

▶ $\ln \frac{1}{x}$

Question No: 15 (Marks: 1) - Please choose one

$\log_b ac =$ -----

▶ $\log_b a + \log_b c$

▶ $\log_a b + \log_c b$

▶

▶ $\log_{a+c} b$

▶

▶ None of these

Question No: 16 (Marks: 1) - Please choose one

$$\log_b \frac{1}{c} = \underline{\hspace{2cm}}$$

- ▶ $\log_b c$
- ▶ $1 - \log_b c$
- ▶ $-\log_b c$
- ▶ $1 + \log_b c$

Question No: 17 (Marks: 1) - Please choose one

$$\log_b \frac{1}{t} = \underline{\hspace{2cm}}$$

- ▶ $\log_b t$
- ▶ $1 - \log_b t$
- ▶ $1 + \log_b t$
- ▶ $-\log_b t$

Question No: 18 (Marks: 1) - Please choose one

If we have $x^2 + y^2 = 1$ then $\frac{dy}{dx} = \underline{\hspace{2cm}}$

- ▶ $\frac{-x}{y}$
- ▶ $\frac{x}{y}$
- ▶ $\frac{-y}{x}$
- ▶ None of these

Question No: 19 (Marks: 1) - Please choose one

$\log_b a^r =$ _____

- ▶ $a \log_b r$
- ▶ $r \log_b a$
- ▶ $\frac{\log_b a}{\log_b r}$
- ▶ $\log_b a + \log_b r$

Question No: 20 (Marks: 1) - Please choose one

Let a function f be defined on an interval, and let x_1 and x_2 denote points in that interval. If $f(x_1) < f(x_2)$ whenever $x_1 < x_2$ then which of the following statement is correct?

- ▶ f is an increasing function.
- ▶ f is a decreasing function.
- ▶ f is a constant function.

Question No: 21 (Marks: 1) - Please choose one

Let a function f be defined on an interval, and let x_1 and x_2 denote points in that interval. If $f(x_1) > f(x_2)$ whenever $x_1 < x_2$ then which of the following statement is correct?

- ▶ f is an increasing function.
- ▶ f is a decreasing function.
- ▶ f is a constant function.

Question No: 22 (Marks: 5)

Differentiate w.r.t. x by chain rule $y = \sqrt{x^2 + 1}$

MIDTERM EXAMINATION

Fall 2008

MTH101- Calculus And Analytical Geometry

Time: 60 min

Marks: 38

For Teacher's Use Only

Q No.	1	2	3	4	5	6	7	8	Total
Marks									
Q No.	9	10	11	12	13	14	15	16	
Marks									
Q No.	17	18	19	20	21				
Marks									

Question No: 1 (Marks: 1) - Please choose one

_____ The
average velocity of a body is V_{ave}

▶ $\frac{d_1 - d_0}{t_1 - t_0}$

▶ $\frac{t_1 - t_0}{f(t_0) - f(t_1)}$

▶ $\lim_{t_1 \rightarrow t_0} \frac{f(t_0) - f(t_1)}{t_1 - t_0}$

▶ None of these

Question No: 2 (Marks: 1) - Please choose one

Consider two function $f(x) = x^3$ and $g(x) = (x+9)$ then $f \circ g(x) =$

▶ $(x+9)^3$

▶ $x+3$

▶ $x+9$

▶ None of these

Question No: 3 (Marks: 1) - Please choose one

Consider two function $f(x) = x^2$ and $g(x) = \sqrt{x}$ then $f \circ g(x) =$

▶ x^2 -correct

▶ x^2

▶ $\sqrt{x}$

► None of these

Question No: 4 (Marks: 1) - Please choose one

Consider two function $f(x) = 3\sqrt{x}$ and $g(x) = \sqrt{x}$ what is true about these functions

► $f(x).g(x) = 3x$

► $f(x)/g(x) = 3x$

►

► $f(g(x)) = 3x$

►

► None of these -correct

Question No: 5 (Marks: 1) - Please choose one

_____ The centre and the radius of the circle $(x+5)^2 + (y-3)^2 = 16$ is

► $(-5,3), 4$

► $(5,-3), 16$

► $(5,-3), 4$

► None of these

Question No: 6 (Marks: 1) - Please choose one

_____ The graph $x = y^2$ is symmetric about

► X-axis

► Y-axis

► Origin

► None of these

Question No: 7 (Marks: 1) - Please choose one

_____ The chain rule is used for two function f and g , if we have ----- of these function

► Product

► Sum

► Composition

► None of these

Question No: 8 (Marks: 1) - Please choose one

A

function f is differentiable function if it is differentiable on the interval

► $(-\infty, \infty)$

► (a, ∞) where a is any negative integer

► $(0, \infty)$

► None of these

Question No: 9 (Marks: 1) - Please choose one

A

function is said to be continuous function if the function is continuous on the interval

► $(-\infty, +\infty)$

► $(0, +\infty)$

► $(-\infty, 0)$

► None of these

Question No: 10 (Marks: 1) - Please choose one

$$\lim_{x \rightarrow 0} \frac{\sin x}{x}$$

► 1

► 2

► 0-correct

► 1/2

Question No: 11 (Marks: 1) - Please choose one

For

any polynomial $P(x) = c_0 + c_1x + \dots + c_nx^n$ and any real number a

$$\lim_{x \rightarrow a} P(x) = c_0 + c_1a + \dots + c_na^n =$$

- ▶ $P(a)$ -correct
- ▶ $P(a+1)$
- ▶ $P(a-1)$
- ▶ $\frac{1}{P(a)}$
- ▶

Question No: 12 (Marks: 1) - Please choose one

_____ The no of x and y intercepts for the equation $y=1/x$

- ▶ Two x intercepts
- ▶ Two y intercepts
- ▶ No x and no y intercepts-correct
- ▶ None of these

Question No: 13 (Marks: 1) - Please choose one

_____ A line is called a tangent line to the circle if it meets the circle at precisely

- ▶ One point -correct
- ▶ Two points
- ▶ Infinite points
- ▶ None of these

Question No: 14 (Marks: 1) - Please choose one

_____ If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) < 0$ then f has relative At x_0

- ▶ Minima -correct
- ▶ Maxima
- ▶ None of these

Question No: 15 (Marks: 1) - Please choose one

_____ If the $\lim_{x \rightarrow a} f(x) = L$ then the inequality $(L - \varepsilon) < f(x) < L + \varepsilon$ holds in any subset of the interval

- ▶ $(a - \delta, a) \cup (a, a + \delta)$
- ▶ $(a - 1, a) \cup (a, a + 1)$
- ▶ $(a - \varepsilon, a) \cup (a, a + \varepsilon)$
- ▶ None of these

Question No: 16 (Marks: 1) - Please choose one

$$\lim_{x \rightarrow 5} \frac{\sqrt{x+4}}{x^2+2} =$$

- ▶ 0
- ▶ ∞
- ▶ 1/9
- ▶ Limit doesn't exist

Question No: 17 (Marks: 2)

Show that $f(x) = x^2 - 3x + 1$ is a continuous function.

$$\lim_{x \rightarrow +\infty} (x^2 - 3x + 1) = +\infty$$

And

$$\lim_{x \rightarrow -\infty} (x^2 - 3x + 1) = +\infty$$

Question No: 18 (Marks: 2)

Find the range of function f defined by $f(x) = x^2 + 5$

Question No: 19 (Marks: 3)

$$y = (\cos x)^{6x}$$

Differentiate:

Question No: 20 (Marks: 5)

Differentiate w.r.t. x by chain rule $y = \cos^2(x^3)$

Question No: 21 (Marks: 10)

Evaluate the following limit.

$$\lim_{x \rightarrow 2} \frac{x^2 + 4x - 12}{x^2 - 2x}$$

Question No: 1 (Marks: 1) - Please choose one

The set $\{\dots, -4, -3, -2, -1, 0, 1, 2, 3, 4, \dots\}$ is known as set of

- ▶ Natural numbers
- ▶ **Integers**
- ▶ Whole numbers
- ▶ None of these

Question No: 2 (Marks: 1) - Please choose one

The

$$h(x) = \frac{1}{(x-2)(x-4)}$$

domain of the function is

- ▶ **$(-\infty, 2) \cup (2, 4) \cup (4, +\infty)$**
- ▶ $(-\infty, 2] \cup \{2, 4\} \cup \{4, \infty)$
- ▶ $(-\infty, 2.5) \cup (2.5, 4.5) \cup (4.5, \infty)$
- ▶ All of these are incorrect

Question No: 3 (Marks: 1) - Please choose one

_____ If
the $\lim_{x \rightarrow a} f(x) = L$ then the inequality $(L - \varepsilon) < f(x) < L + \varepsilon$ holds in any subset of the interval

- ▶ $(a - \delta, a) \cup (a, a + \delta)$
- ▶ $(a - 1, a) \cup (a, a + 1)$
- ▶ $(a - \varepsilon, a) \cup (a, a + \varepsilon)$
- ▶ None of these

Question No: 4 (Marks: 1) - Please choose one

_____ $L - \varepsilon < f(x) < L + \varepsilon$
Can be written as

- ▶ $|f(x) - L| < \varepsilon$
- ▶ $|f(x) - L| > \varepsilon$
- ▶ $|f(x) - L| < \varepsilon + 1$
- ▶ None of these

Question No: 5 (Marks: 1) - Please choose one

_____ If
a function satisfies the conditions

$f(c)$ is defined

$$\lim_{x \rightarrow c^+} f(x)$$

Exists

$$\lim_{x \rightarrow c^+} f(x) = f(c)$$

Then the function is said to be

► Continuous at c

- Continuous from left at c
- Continuous from right at c
- None of these

Question No: 6 (Marks: 1) - Please choose one

$$\frac{d}{dx}[\sec] = \text{-----}$$

► $\frac{\sin x}{1 - \sin^2 x}$

► $\frac{-\sin x}{1 - \sin^2 x}$

► $\frac{1}{1 - \sin^2 x}$

- None of these

Question No: 7 (Marks: 1) - Please choose one

$$\log_b ac = \text{-----}$$

► $\log_b a + \log_b c$

► $\log_a b + \log_c b$

► $\log_{a+c} b$

- None of these

Question No: 8 (Marks: 1) - Please choose one

$$\log_b a^r = \text{-----}$$

- ▶ $a \log_b r$
- ▶ $r \log_b a$
- ▶ $b \log_a r$
- ▶ None of these

Question No: 9 (Marks: 1) - Please choose one

_____ If $f''(x) < 0$ on an open interval (a,b) then f is ----- on (a,b)

- ▶ None of these
- ▶ Concave up
- ▶ Concave down
- ▶ Closed

Question No: 10 (Marks: 1) - Please choose one

_____ If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) > 0$ then f has relative At x_0

- ▶ Minima
- ▶ Maxima
- ▶ None of these

Question No: 11 (Marks: 1) - Please choose one

_____ A line is called a tangent line to the circle if it meets the circle at precisely

- ▶ One point
- ▶ Two points
- ▶ Infinite points
- ▶ None of these

Question No: 12 (Marks: 1) - Please choose one

The equation $(x+4)^2 + (y-1)^2 = 6$ represents a circle having center at and radius

- ▶ **$(-4,1), \sqrt{6}$**
- ▶ $(-4,1), 6$
- ▶ $(-4,-1), \sqrt{6}$
- ▶ None of these

Question No: 13 (Marks: 1) - Please choose one

_____ The
 $\lim_{x \rightarrow a} f(x)$ where $f(x) = k$
(k is a constant) is equal to

- ▶ k+2
- ▶ k+1
- ▶ **k**
- ▶ kf

Question No: 14 (Marks: 1) - Please choose one

_____ For
any polynomial $P(x) = c_0 + c_1x + \dots + c_nx^n$ and any real number a
 $\lim_{x \rightarrow a} P(x) = c_0 + c_1a + \dots + c_na^n =$

- ▶ **$P(a)$**
- ▶ $P(a+1)$
- ▶ $P(a-1)$
- ▶ $\frac{1}{P(a)}$
- ▶

Question No: 15 (Marks: 1) - Please choose one

Polynomials are always Function

- ▶ Continuous
- ▶ Discontinuous

Question No: 16 (Marks: 1) - Please choose one

$$\frac{D}{Dx}[dh(x)] = \text{-----}$$

where d is a constant

- ▶ $dh(x)$
- ▶ $dh'(x)$
- ▶ 0
- ▶ None of these

Question No: 17 (Marks: 1) - Please choose one

The graph $x = y^2$ is symmetric about

- ▶ X-axis
- ▶ Y-axis
- ▶ Origin
- ▶ None of these

Question No: 18 (Marks: 1) - Please choose one

Consider two function $f(x) = 3\sqrt{x}$ and $g(x) = \sqrt{x}$ what is true about these functions

- ▶ $f(x).g(x) = 3x$
- ▶ $\frac{f(x)}{g(x)} = 3x$
- ▶ $f(g(x)) = 3x$
- ▶ None of these

Question No: 19 (Marks: 1) - Please choose one

_____ The

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

formula

is called with respect to x of the function f

- ▶ Derivative
- ▶ Slope
- ▶ Tangent
- ▶ None of these

Question No: 20 (Marks: 1) - Please choose one

Suppose that f and g are differentiable function of x then $\frac{d}{dx}(\frac{f}{g})$

▶ $\frac{g \cdot f' - f \cdot g'}{g^2}$

▶ $\frac{g \cdot f' + f \cdot g'}{g^2}$

▶ $\frac{g \cdot f' - f \cdot g'}{g}$

- ▶ None of these

Question No: 21 (Marks: 2)

_____ If

$$\frac{dy}{dx} = -\frac{3yx^2 + 1}{28y^3 + x^3}$$

then find the slope of the tangent line at the point (2, 0).

Question No: 22 (Marks: 3)

$$\text{Let } f(x) = \begin{cases} \frac{x^2 - x - 2}{x + 1} & \text{if } x \neq -1 \\ -3 & \text{if } x = -1 \end{cases}$$

At what points the function f is continuous and discontinuous? At point of discontinuity if any explain why it is discontinuous?

Question No: 23 (Marks: 5)

Differentiate w.r.t. x by chain rule $y = \sqrt{x^2 + 1}$

Question No: 24 (Marks: 10)

$$\lim_{y \rightarrow -2} g(y) \text{ where, } g(y) = \begin{cases} y^2 + 5 & \text{if } y < -2 \\ 3 - 3y & \text{if } y \geq -2 \end{cases}$$

Evaluate the following limit

**MIDTERM EXAMINATION
Spring 2012**

MTH101- Calculus And Analytical Geometry

Time: 60 min

Marks: 40

Question No: 1 (Marks: 1) - Please choose one

$$30^\circ = \underline{\hspace{2cm}}$$

▶ $\frac{\pi}{3}$

▶ $\frac{\pi}{4}$

▶ $\frac{\pi}{6}$

$$\frac{\pi}{2}$$



Question No: 2 (Marks: 1) - Please choose one

Let a function f be defined on an interval, and let x_1 and x_2 denotes two distinct points in that interval. If $f(x_1) = f(x_2)$ for all points x_1 and x_2 then which of the following statement is correct?

- ▶ f is a decreasing function
- ▶ f is an increasing function
- ▶ f is a constant function

Question No: 3 (Marks: 1) - Please choose one

Tan(x) is continuous every where except at points

$$\pm \frac{k\pi}{2} (k = 1, 3, 5, \dots)$$



$$\pm \frac{k\pi}{2} (k = 2, 4, 6, \dots)$$



$$\pm \frac{k\pi}{2} (k = 1, 2, 3, 4, 5, 6, \dots)$$



Question No: 4 (Marks: 1) - Please choose one

$$\lim_{x \rightarrow \infty} (-2x) =$$

- ▶ -2
- ▶ 0
- ▶ 2
- ▶ Does not exist

Question No: 5 (Marks: 1) - Please choose one

Suppose that f and g are differentiable functions of x then

$$\frac{d}{dx}[f][g] =$$

- ▶ $\frac{[f'] [g] - [f] [g']}{g^2}$
- ▶ $[f'] [g']$
- ▶ $[f'] [g] + [f] [g']$
- ▶ $[f'] [g] - [f] [g']$

Question No: 6 (Marks: 1) - Please choose one

The solution set of the inequality $|x+4| \geq 2$ is

- ▶ $(-\infty, -6] \cup [2, +\infty)$
- ▶ None of these
- ▶ $(-\infty, 6] \cup [-2, +\infty)$
- ▶ $(-\infty, -6] \cup [-2, +\infty)$

Question No: 7 (Marks: 1) - Please choose one

A line is called a tangent line to the circle if it meets the circle at precisely

- ▶ One point
- ▶ Two points
- ▶ Infinite points

Question No: 8 (Marks: 1) - Please choose one

Let
a function f be defined on an interval, and let x_1 and x_2 denote points in that interval.
If $f(x_1) < f(x_2)$ whenever $x_1 < x_2$ then which of the following statement is correct?

- ▶ f is an increasing function.
- ▶ f is a decreasing function.
- ▶ f is a constant function.

Question No: 9 (Marks: 1) - Please choose one

If
 $f(x) = 3x^8 + 2x + 1$ then $f'(x) =$ _____

- ▶ $3x^7 + 2$
- ▶ $24x^7 + 2$
- ▶ $3x^9 + 2x^2$
- ▶ $24x^9 + 2x^2$

Question No: 10 (Marks: 1) - Please choose one

π
is anumber

- ▶ Integer
- ▶ Rational
- ▶ Irrational
- ▶ Natural

Question No: 11 (Marks: 1) - Please choose one

The
set $\{x : a \leq x \leq b\}$ can be written in the form of interval

- ▶ (a,b)
- ▶ (a,b]
- ▶ [a,b]

Question No: 12 (Marks: 1) - Please choose one

Suppose that f and g are differentiable functions of x then

$$\frac{d}{dx} \left[\frac{f}{g} \right] =$$

$$\frac{[g][f'] - [f][g']}{g^2}$$



$$\frac{[g'][f] - [f'][g]}{g^2}$$



$$\frac{[g][f'] - [f][g']}{f^2}$$



$$\frac{[g'][f] - [f'][g]}{f^2}$$



Question No: 13 (Marks: 1) - Please choose one

The graph $x = y^2$ is symmetric about -----axis

- ▶ X-axis
- ▶ Y-axis
- ▶ Origin

Question No: 14 (Marks: 1) - Please choose one

$$\lim_{x \rightarrow -7} \frac{x^2 - 49}{x + 7}$$

- ▶ -14
- ▶ 0
- ▶ ∞
- ▶ Limit does not exist

Question No: 15 (Marks: 1) - Please choose one

Chain rule is a rule for differentiating _____ of functions.

- ▶ Product
- ▶ Sum
- ▶ Difference
- ▶ Composition

Question No: 16 (Marks: 1) - Please choose one

_____ The
 $\lim_{x \rightarrow a} f(x) = \dots\dots\dots$ where $f(x) = k$
 (k is a constant)

- ▶ k+2
- ▶ k+1
- ▶ k

Question No: 17 (Marks: 1) - Please choose one

_____ For
 any number $\varepsilon > 0$ if we can find an open interval (x_0, x_1) on the x-axis containing the
 point "a" such that $L - \varepsilon < f(x) < L + \varepsilon$ for each x in (x_0, x_1) except the possible x = a
 then we say $\lim_{x \rightarrow a} f(x) = \dots\dots\dots$

- ▶ L
- ▶ $L - \varepsilon$
- ▶ $L + \varepsilon$
- ▶ $L + 1$

Question No: 18 (Marks: 1) - Please choose one

_____ If
 $2x - y = -3$ then $\frac{dy}{dx} =$

- ▶ 2
- ▶ -2
- ▶ 0
- ▶ -3

Question No: 19 (Marks: 1) - Please choose one

_____ The

graph of the equation $y = x^2 - 4x + 5$ will represent

- ▶ Parabola
- ▶ Straight line
- ▶ Two straight lines
- ▶ Ellipse

Question No: 20 (Marks: 1) - Please choose one

_____ The equation of line of the form $y - y_1 = m(x - x_1)$ is known as

- ▶ Point-slope form
- ▶ Two points form
- ▶ Intercepts form
- ▶ Slope intercept form

Question No: 21 (Marks: 2)

_____ If $y = 5 \cos(x^2 + 1)$ Find dy/dx by using "The chain rule".

Question No: 22 (Marks: 2)

_____ Prove that $\lim_{x \rightarrow 1} (x + 5) = 6$, using the definition of limit.

Question No: 23 (Marks: 3)

Find an equation of the tangent line to the curve

$$y = \frac{2}{x^2 + x}$$

at the point where $x = 1$

Question No: 24 (Marks: 3)

$$\lim_{x \rightarrow 0} \frac{\sin(5x)}{3x}$$

Compute

Question No: 25 (Marks: 5)

$$f(x) = x^4 - 4x^3 + 4x^2$$

Find all critical points of

Question No: 26 (Marks: 5)

$$\frac{dy}{dx} \quad y = x^2 (\cot x) - \frac{1}{x^2}$$

Find if

**MIDTERM EXAMINATION
Fall 2010**

MTH101- Calculus And Analytical Geometry

Question No: 1 (Marks: 1) - Please choose one

_____ If
f is a twice differentiable function at a stationary point x_0 and $f''(x_0) > 0$ then f has
relative At x_0

- ▶ Minima
- ▶ Maxima
- ▶ None of these

Question No: 2 (Marks: 1) - Please choose one

_____ If
f is a twice differentiable function at a stationary point x_0 and $f''(x_0) < 0$ then f has
relative At x_0

- ▶ Minima

- ▶ Maxima
- ▶ None of these

Question No: 3 (Marks: 1) - Please choose one

_____ A

line $x = x_0$ is called ----- for the graph of a function f if
 $f(x) \rightarrow +\infty$ or $f(x) \rightarrow -\infty$ as x approaches x_0 from the right or from the left

- ▶ Horizontal asymptotes
- ▶ None of these
- ▶ Vertical asymptotes

Question No: 4 (Marks: 1) - Please choose one

_____ If

$f(x) = 3x^8 + 2x + 1$ then $f'(x) =$ _____

- ▶ $3x^7 + 2$
- ▶ $24x^7 + 2$
- ▶ $3x^9 + 2x^2$
- ▶ $24x^9 + 2x^2$

Question No: 5 (Marks: 1) - Please choose one

_____ If

$y = \frac{1}{1-x}$ $\frac{dy}{dx} =$

then

- ▶ 1
- ▶ -1
- ▶ $\frac{1}{(1-x)^2}$

▶ $\frac{-1}{(1-x)^2}$

Question No: 6 (Marks: 1) - Please choose one

_____ If

$2x - y = -3$ then $\frac{dy}{dx} =$

▶ 2

▶ -2

▶ 0

▶ -3

Question No: 7 (Marks: 1) - Please choose one

If

$x^2 + y^2 = 9$ then $\frac{dy}{dx} =$

$\frac{x}{y}$

▶

$\frac{-x}{y}$

▶

$\frac{-y}{x}$

▶

$\frac{y}{x}$

▶

Question No: 8 (Marks: 1) - Please choose one

$\frac{d}{dx} [\sec x] =$ _____

$\frac{1}{1 + \sin^2 x}$

▶

$\frac{-\sin x}{1 + \sin^2 x}$

▶

☐ $\frac{1}{1 - \sin^2 x}$
☐ $\frac{\sin x}{1 - \sin^2 x}$

Question No: 9 (Marks: 1) - Please choose one

_____ 30°
= _____

☐ $\frac{\pi}{3}$
☐ $\frac{\pi}{4}$
☒ $\frac{\pi}{6}$

☐ $\frac{\pi}{2}$

Question No: 10 (Marks: 1) - Please choose one

Suppose that f and g are differentiable functions of x then

$\frac{d}{dx}[f][g] =$

☐ $\frac{[f'] [g] - [f] [g']}{g^2}$
☐ $[f'] [g']$

► $[f']g + [f]g'$ -correct

► $[f']g - [f]g'$

Question No: 11 (Marks: 1) - Please choose one

Suppose that f and g are differentiable functions of x then

$$\frac{d}{dx} \left[\frac{f}{g} \right] =$$

► $\frac{[g][f'] - [f][g']}{g^2}$

► $\frac{[g']f - [f']g}{g^2}$

► $\frac{[g][f'] - [f][g']}{f^2}$

► $\frac{[g']f - [f']g}{f^2}$

Question No: 12 (Marks: 1) - Please choose one

_____ If a function g is differentiable at a point x and a function f is differentiable at a point $g(x)$, then the _____ is differentiable at point x .

- Composition $(f \circ g)$
- Quotient (f / g)
- Product $(f \cdot g)$
- Sum $(f + g)$

Question No: 13 (Marks: 1) - Please choose one

Chain rule is a rule for differentiating _____ of functions.

- Product
- Sum

► Difference

► Composition -correct

Question No: 14 (Marks: 1) - Please choose one

_____ The

$$\frac{d}{dx}[x^n] = nx^{n-1}$$

 power rule, _____ holds if n is _____

► An integer

- A rational number
- An irrational number
- All of the above

Question No: 15 (Marks: 1) - Please choose one

_____ Let
 a function f be defined on an interval, and let x_1 and x_2 denote points in that interval.
 If $f(x_1) < f(x_2)$ whenever $x_1 < x_2$ then which of the following statement is correct?

► f is an increasing function.

► f is a decreasing function.

► f is a constant function.

Question No: 16 (Marks: 1) - Please choose one

_____ Let
 a function f be defined on an interval, and let x_1 and x_2 denote points in that interval.
 If $f(x_1) > f(x_2)$ whenever $x_1 < x_2$ then which of the following statement is correct?

► f is an increasing function.

► f is a decreasing function.

► f is a constant function.

Question No: 17 (Marks: 1) - Please choose one

_____ If
 $f''(x) > 0$
 on an open interval (a,b), then which of the following statement is correct?

► f is concave up on (a, b) -correct

► f is concave down on (a, b).

► f is linear on (a, b).

Question No: 18 (Marks: 1) - Please choose one

If $x > 0$ then $\frac{d}{dx}[\ln x] =$ _____

▶ 1

▶ x

▶ $\frac{1}{x}$

▶ $\ln \frac{1}{x}$

Question No: 19 (Marks: 1) - Please choose one

$y = (x^3 + 2x)^{37}$. Which of the following is correct? Let

▶ $\frac{dy}{dx} = (37)(x^3 + 2x)^{36}$

▶ $\frac{dy}{dx} = 111x^2(x^3 + 2x)^{36}$

▶

▶ $\frac{dy}{dx} = (111x^2 + 74)(x^3 + 2x)^{36}$

▶

▶ $\frac{dy}{dx} = (111x^2 + 74)(x^3 + 2x)^{38}$

▶

Question No: 20 (Marks: 1) - Please choose one

What is the base of natural logarithm?

▶ 2.71

▶ 10

- ▶ 5
- ▶ Any real number

Question No: 21 (Marks: 1) - Please choose one

_____ If
we have $x^2 + y^2 = 1$ then $\frac{dy}{dx} =$ _____

▶ $\frac{-x}{y}$

▶ $\frac{x}{y}$

▶ $\frac{-y}{x}$

- ▶ None of these

Question No: 22 (Marks: 1) - Please choose one

_____ $\log_b a^r =$ _____

▶ $a \log_b r$

▶ $r \log_b a$ -correct

▶ $\frac{\log_b a}{\log_b r}$

▶ $\log_b a + \log_b r$

Question No: 23 (Marks: 1) - Please choose one

$$\log_b \frac{1}{c} = \underline{\hspace{2cm}}$$

- ▶ $\log_b c$
- ▶ $1 - \log_b c$
- ▶ $-\log_b c$
- ▶ $1 + \log_b c$

Question No: 24 (Marks: 1) - Please choose one

$$\log_b \frac{1}{t} = \underline{\hspace{2cm}}$$

- ▶ $\log_b t$
- ▶ $1 - \log_b t$
- ▶ $1 + \log_b t$
- ▶ $-\log_b t$ -correct

Question No: 25 (Marks: 3)

$$y = x^{\sqrt{x}} e^{5x+6}$$

Differentiate:

Question No: 26 (Marks: 5)

Differentiate $y = (x^3 + 7x - 1)(5x + 2)$

Question No: 27 (Marks: 10)

_____ The derivative of a continuous function is given .Find all critical points and determine whether a relative maximum, relative minimum or neither occur there

$$f'(x) = 2\sin^3 x - \sin^2 x \quad ; \quad 0 < x < 2\pi$$

Question No: 1 (Marks: 1) - Please choose one

_____ If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) < 0$ then f has relative At x_0

- ▶ Minima
- ▶ **Maxima**
- ▶ None of these

Note:Maxima(If Maxima refers to local maximum)

Question No: 2 (Marks: 1) - Please choose one

_____ A line $x = x_0$ is called ----- for the graph of a function f if $f(x) \rightarrow +\infty$ or $f(x) \rightarrow -\infty$ as x approaches x_0 from the right or from the left

- ▶ Horizontal asymptotes
- ▶ None of these
- ▶ **Vertical asymptotes**

Question No: 3 (Marks: 1) - Please choose one

_____ A line $y = y_0$ is called a for the graph f if $\lim_{x \rightarrow +\infty} f(x) = y_0$ or $\lim_{x \rightarrow -\infty} f(x) = y_0$

- ▶ Vertical asymptotes
- ▶ Horizontal asymptotes
- ▶ **None of these**

Question No: 4 (Marks: 1) - Please choose one

According to Power-Rule of differentiation, if $f(x) = x^n$ where n is a real number, then

$$\frac{d}{dx}[x^n] =$$

- ▶ x^{n-1}
- ▶ **nx^{n-1}**
- ▶ nx^{n+1}
- ▶ $(n-1)x^{n+1}$

Question No: 5 (Marks: 1) - Please choose one

$$y = \frac{1}{1-x} \quad \frac{dy}{dx} =$$

then

- ▶ 1
- ▶ **-1**
- ▶ $\frac{1}{(1-x)^2}$
- ▶ $\frac{-1}{(1-x)^2}$

Question No: 6 (Marks: 1) - Please choose one

$$xy = 4 \quad \frac{dy}{dx} =$$

then

- ▶ 0
- ▶ **$\frac{-1}{x^2}$**

▶ $\frac{4}{x^2}$

▶ $\frac{-4}{x^2}$

Question No: 7 (Marks: 1) - Please choose one

_____ If

$2x - y = -3$ then $\frac{dy}{dx} =$

▶ 2

▶ -2

▶ 0

▶ -3

Question No: 8 (Marks: 1) - Please choose one

$\frac{d}{dx} [\sec x] =$ _____

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▶ $\frac{-\sin x}{1 + \sin^2 x}$

▶ $\frac{1}{1 - \sin^2 x}$

▶ $\frac{\sin x}{1 - \sin^2 x}$

Question No: 9 (Marks: 1) - Please choose one

_____ 30°
= _____

$\frac{\pi}{3}$



$\frac{\pi}{4}$



$\frac{\pi}{6}$



$\frac{\pi}{2}$



Question No: 10 (Marks: 1) - Please choose one

Consider a function $h(x)$ and a constant c then

$\frac{d}{dx}((c) \{h(x)\}) = \underline{\hspace{2cm}}$

▶ 0

▶ $\frac{d}{dx}(h(x))$

▶ $\frac{d}{dx}(h(cx))$

▶ $c \frac{d}{dx}(h(x))$

Question No: 11 (Marks: 1) - Please choose one

$\frac{d}{dx}[\operatorname{cosec} x] = \underline{\hspace{2cm}}$

▶ $\frac{1}{1 + \cos^2 x}$

▶ $\frac{-\cos x}{1 - \cos^2 x}$

▶ $\frac{-\cos x}{1 - \cos^2 x}$

▶ $\frac{1}{1 - \cos^2 x}$

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Chain rule is a rule for differentiating _____ of functions.

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- ▶ Sum
- ▶ Difference
- ▶ Composition

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_____ The

$$\frac{d}{dx}[x^n] = nx^{n-1}$$

power rule, _____ holds if n is _____

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- ▶ An irrational number
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- ▶ f is a decreasing function.
- ▶ f is a constant function.

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- ▶ f is concave down on (a, b).
- ▶ f is linear on (a, b).

Question No: 16 (Marks: 1) - Please choose one

If $f''(x) < 0$ on an open interval (a,b) then which of the following statement is correct?

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- ▶ f is concave down on (a, b).
- ▶ f is linear on (a, b).

Question No: 17 (Marks: 1) - Please choose one

If $x > 0$ then $\frac{d}{dx}[\ln x] =$ _____

- ▶ 1
- ▶ x
- ▶ $\frac{1}{x}$
- ▶ $\ln \frac{1}{x}$

Question No: 18 (Marks: 1) - Please choose one

If $b > 0$ then $\frac{d}{dx}[b^x] =$ _____

- ▶ 0
- ▶ xb^{x-1}
- ▶ $\ln b$
- ▶ $b^x \ln b$

Question No: 19 (Marks: 1) - Please choose one

Let $y = (x^3 + 2x)^{37}$. Which of the following is correct?

☐ $\frac{dy}{dx} = (37)(x^3 + 2x)^{36}$



☐ $\frac{dy}{dx} = 111x^2(x^3 + 2x)^{36}$



☐ $\frac{dy}{dx} = (111x^2 + 74)(x^3 + 2x)^{36}$



$\frac{dy}{dx} = (111x^2 + 74)(x^3 + 2x)^{38}$



Question No: 20 (Marks: 1) - Please choose one

What is the base of natural logarithm?

☒ 2.71

▶ 10

▶ 5

▶ Any real number

Question No: 21 (Marks: 1) - Please choose one

Let x_0 be critical points of the function f . Those critical points for which $f'(x_0) = 0$ are called _____ of f

▶ Local points

▶ End points

☒ Stationary points

Question No: 22 (Marks: 1) - Please choose one

$$\log_b a^r = \underline{\hspace{2cm}}$$

- ▶ $a \log_b r$
- ▶ $r \log_b a$
- ▶ $\frac{\log_b a}{\log_b r}$
- ▶ $\log_b a + \log_b r$

Question No: 23 (Marks: 1) - Please choose one

$$\log_b \frac{1}{c} = \underline{\hspace{2cm}}$$

- ▶ $\log_b c$
- ▶ $1 - \log_b c$
- ▶ $-\log_b c$
- ▶ $1 + \log_b c$

Question No: 24 (Marks: 1) - Please choose one

$$\log_b \frac{1}{t} = \underline{\hspace{2cm}}$$

- ▶ $\log_b t$
- ▶ $1 - \log_b t$
- ▶ $1 + \log_b t$
- ▶ $-\log_b t$

Question No: 25 (Marks: 3)

If $f(x) = x^4 - 8x^2$, determine all relative extrema for the function. Using First Derivative Test.

Solution:

$$f = x^4 - 8x^2$$

$$f' = 4x^3 - 16x$$

$$f' = 0$$

$$4x^3 - 16x = 0$$

$$x(4x^2 - 16) = 0$$

$$x = 0$$

$$4x^2 - 16 = 0$$

$$x^2 = \frac{16}{4}$$

$$x^2 = 4$$

$$x = \pm 2$$

Relative extrema $(0, \pm 2)$Ans

Question No: 26 (Marks: 5)

Differentiate $y = x^{-2}(4 + 3x^{-3})$

Solution:

$$y = 4x^{-2} + 3x^{-3} \cdot x^{-2}$$

$$= 4x^{-2} + 3x^{-5}$$

$$\frac{dy}{dx} = 4 \frac{d}{dx}(x^{-2}) + 3 \frac{d}{dx}(x^{-5})$$

$$= 4(-2)x^{-2-1} + 3 \frac{d}{dx} - 5x^{-5-1}$$

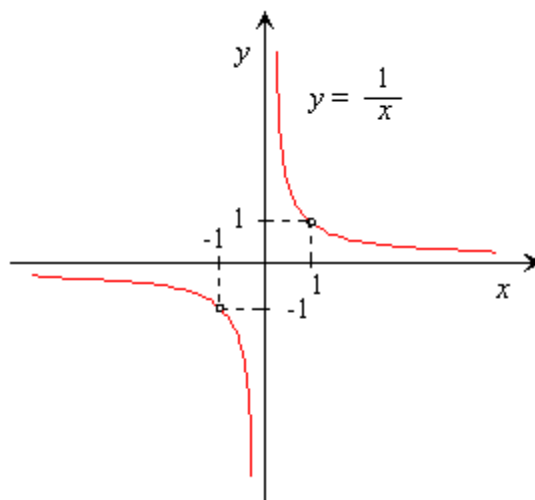
$$= -8x^{-3} + (-15x^{-6})$$

$$\frac{dy}{dx} = -8x^{-3} - 15x^{-6} \dots \dots \text{Ans}$$

Question No: 27 (Marks: 10)

$$f(x) = \frac{1}{x}$$

Determine the intervals in which the graph of the function is concave upward or downward.



Solution:

$$f(x) = \frac{1}{x}$$

$$f'(x) = -\frac{1}{x^2}$$

X	1	2	3	4
F(x)	-1	-0.25	-0.11	-0.625

Conclusion:

$f'(x)$ is increasing when x is from $(0, \infty)$

so,

It is concave up.

$f'(x)$ is decreasing when x is from $(-\infty, 0)$

so,

It is concave down