

MIDTERM EXAMINATION
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

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

If _____ then

▶ 1

▶ -1

▶ $\frac{1}{(1-x)^2}$

▶ $\frac{-1}{(1-x)^2}$

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

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

▶ 2

▶ -2

▶ 0

▶ -3

Question No: 7 (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: 8 (Marks: 1) - Please choose one

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

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

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

$30^0 =$ _____

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

- ☐ $\frac{\pi}{2}$

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

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

The 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

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

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

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

- ☐ $a \log_b r$
- ☒ $r \log_b a$ -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)

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

Differentiate

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

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