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 $f(x) \to +\infty \; or \; f(x) \to -\infty$ 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 $y=\frac{1}{1-x}$ then $\frac{dy}{dx}=$

- ▶ 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

$30^0 =$ _________

▶ $\frac{\pi}{3}$

▶ $\frac{\pi}{4}$

▶ $\frac{\pi}{6}$

▶ $\frac{\pi}{2}$

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 o g)
- ▶ Quotient (f / g)
- ▶ Product (f . 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 power rule, $\frac{d}{dx}[x^n] = nx^{n-1}$ 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

$\log_b a^r =$ ________

► $a \log_b r$

► $r \log_b a$ **-correct**

► $\frac{\log_b a}{\log_b r}$

► $\log_b a + \log_b r$

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

$\log_b \frac{1}{c} =$ ________

▶ $\log_b c$

▶ $1-\log_b c$

▶ $-\log_b c$

▶ $1+\log_b c$

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

$\log_b \frac{1}{t} =$ ________

▶ $\log_b t$

▶ $1-\log_b t$

▶ $1+\log_b t$

▶ $-\log_b t$ **-correct**

Question No: 25 (Marks: 3)

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

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

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