

MIDTERM EXAMINATION

MTH101- Calculus And Analytical Geometry (Session - 6)
Time: 60 min

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 domain of the function $h(x) = \frac{1}{(x-2)(x-4)}$ 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

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

☒ $\frac{\sin x}{1 - \sin^2 x}$

☐ $\frac{-\sin x}{1 - \sin^2 x}$

☐ $\frac{1}{1 - \sin^2 x}$

☐ None of these

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

$$\log_b ac = - \dots$$

☒ $\log_b a + \log_b c$

- ▶ $\log_a b + \log_c b$
- ▶ $\log_{a+c} b$
- ▶ None of these

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

$\log_b a^r =$ - - - - -

- ▶ $a \log_b r$
- ▶ $r \log_b a$
- ▶ $b \log_a r$
- ▶ 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

$\frac{D}{Dx}[dh(x)] = - \dots$ 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 formula $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ 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 $\frac{d}{dx}\left(\frac{f}{g}\right)$

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

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

► $\frac{g \cdot f' - f \cdot g'}{g}$

► None of these

Question No: 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 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)

Evaluate the following limit

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