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FINALTERM EXAMINATION
Fall 2008
MTH101- Calculus And Analytical Geometry (Session - 1)
Marks: 70

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

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

- ► Composition f (g(x))
- ► Product f (g(x))
- ► Composition f (g(x+f))
- ► None of these

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

Let f be a function on an interval, and $x_1 \; and \; x_2$ denote the points in that interval, if $f(x_1) < f(x_2)$ whenever $x_1 < x_2$ then the we can say that f is

- ► Increasing function
- ► Decreasing function
- ► Constant function
- ► None of these

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

Sigma notation is represented by the …… Greek letter.

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- M
- None of these
- Σ
- N

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

The series $1^2 + 2^2 + 3^2 + 4^2 - - - n^2$ can be written as

- $\frac{n(n+1)(2n+1)}{6}$
- $\frac{n(2n)(2n+1)}{6}$
- $\frac{(n+1)(n+2)}{2}$
- None of these

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

Consider the integral $\int_0^2 x^2 dx$, the area on left is bounded by

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- $y = x^2$
- $x = 2$
- $x = 0$
- None of these

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

The two curves $y = x^2 \; and \; y = x + 6$ intersect at the points

- $x = -2 \; and \; x = 3$
- $x = 0 \; and \; x = 3$
- None of these
- $x = 2 \; and \; x = 3$

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

By using cylindrical shell to find the volume of the solid when the region R in the first quadrent enclosed between $y = x \, and \, y = x^2$ is revolved about y-axis,the volume will be represented by

$$V = \int_0^1 2\pi x(x - x^2)dx$$

-

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$$V = \int_{2}^{4} 2\pi . x^2 dx$$

►

$$V = \int_{0}^{4} x^2 dx$$

►

► None of these

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

If f is a smooth curve on the interval [a,b] ,the arc length L of the curve f(x) defined over the interval [a,b] is

$$L = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))^2}\, \Delta x_k$$

►

$$L = \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))} \Delta x_k$$

►

► None of these

$$L = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))}$$

►

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

Suppose that an object moves in the positive direction along a coordinate line while subject to a force F(x) in the direction of motion, the work done will be when it is moved over an interval [a,b]

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$$W = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} F(x^*_k)\Delta x_k$$

►

$$W = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} F(x^*_k)$$

►

► None of these

$$W = \lim \sum_{k=1}^{n} F(x^*_k)\Delta x_k$$

►

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

A sequence or infinite sequence is a function whose domain is set of positive ……that is $\{a_n\}_{n=1}^{+\infty}$

► Integers

► Rational

► Real

► None of these

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

For a sequence $\{a_n\}$ if the difference between successive terms $a_{n+1} - a_n \geq 0$ the sequence is known as

► Increasing

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► Decreasing

► Nondecreasing

► Nonincreasing

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

The sequence $\{\frac{1}{n}\}_{n=1}^{\infty}$ is

► Increasing

► Decreasing

► Nonincreasing

► Nondecreasing

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

If $f(n) = a_n$ is the nth term of the sequence and f is differentiable and $f'(n) < 0$ then the sequence will be

► Increasing

► Decreasing

► Nondecreasing

► Nonincreasing

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

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$$\sum (-1)^{k+1} \frac{1}{k}$$

The series is

- ► Arithmetic
- ► Alternating
- ► Harmonic
- ► Geometric

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

For an alternating series to be convergent which of the following conditions must be satisfied

- ► $a_1 > a_2 > a_3 ..... > a_k > ....$
- ► $\lim_{k \to \infty} a_k = 0$
- ► All of these

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

The Maclaurin series for e^x

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$$1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+...+\frac{x^k}{k!}+...$$

►

$$x+\frac{x^2}{2!}+\frac{x^3}{3!}+...+\frac{x^k}{k!}+...$$

►

$$1+x+\frac{x^3}{3!}+...+\frac{x^k}{k!}+...$$

►

► None of these

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

Let L_1 and L_2 be non vertical lines with slopes m_1 and m_2 ,respectively Both the lines are parallel if and only if

► $m1 = m2$

► $m1 \neq m2$

$$m1 = \frac{1}{m2}$$

►

► None of these

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

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

► $(x+9)^3$

► $x+3$

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- $x+9$
- None of these

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

Consider the $f(x)=\begin{cases}x+2 & if\ x\leq 2\\ 2 & if\ x>2\end{cases}$ then f(2)

- 2
- $x+2$
- 4
- None of these

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

f' is the function whose value at x is the …….. of the tangent line of the graph of the function f at x

- Secant
- Tangent
- Slope
- None of these

Question No: 21 (Marks: 2)

$\int_a^b f(x)dx \quad \int_a^c f(x)dx=10, \int_c^d f(x)dx=7, \int_b^d f(x)dx=3$

Calculate if

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Question No: 22 (Marks: 2)

Find the integral of the surface area of the portion of the sphere generated by revolving

$$y = \sqrt{2 - x^2}\ , 0 \le x \le \frac{1}{3}$$

the curve
(Note: Just find the integral do not solve the integral)

Question No: 23 (Marks: 2)

$$\sum_{k=2}^{\infty} \frac{1}{(k-1)!}$$

Check the convergence of the sequence using the ratio test.

Question No: 24 (Marks: 3)

$$\int_{4}^{0} \sqrt{x}\,(x-2)\,dx$$

Integrate:

Question No: 25 (Marks: 3)

Find the volume of the solid that is obtained when the region under the curve $y = \sqrt{x}$ on $[2,5]$ is revolved about the $x - axis$.

Question No: 26 (Marks: 3)

$$\sum_{k=0}^{\infty} \frac{k+2}{2k+7}$$

Determine whether the following series is convergent or divergent:

Question No: 27 (Marks: 5)

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$$\sum_{k=1}^{n} \frac{3k}{n}$$

Express sum in close form.

Question No: 28 (Marks: 5)

Determine whether the sequence converges or diverges. If converges find limit

$$\lim_{n\to\infty} \frac{\sqrt{n+1}}{n}$$

Question No: 29 (Marks: 5)

Evaluate the integral by substitutions

$$\int \frac{1}{\sqrt{x}.(1+\sqrt{x})^2}\,dx$$

Question No: 30 (Marks: 10)

Evaluate the improper integrals

$$\int_0^{\infty} xe^{-x}\,dx$$

Question No: 31 (Marks: 10)

Determine whether the series converge or diverge? If the series converges, find its sum

$$\sum_{n=1}^{\infty} \ln\left(\frac{n}{n+1}\right)$$

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