FINALTERM EXAMINATION
Fall 2008
(Session - 1)

Calculus & Analytical Geometry-I Guls

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UPDATED VERSION
Exclusive thanks to Mahar Azahar (Lodhran)

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

If $y = f(x)$ then the average rate of change of y with respect to x over the interval $[x_0, x_1]$ is the .... Joining the points $(x_0, f(x_0)) \, and \, (x_1, f(x_1))$ on the graph of f
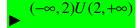
► Slope of the secant line
► Slope of tangent line
► Secant line
► none of these

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

Natural domain of $\dfrac{(x^2 - 4)}{(x - 2)}$ is

► $(-\infty, 2) U (2, +\infty)$
► $(-\infty, 2)$
► $(-\infty, 0)$
► None of these

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Question No: 3   (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: 4   (Marks: 1)   - Please choose one

The series $\sum u_k$ be a series with positive terms and suppose that $\rho = \lim_{k \to \infty} \sqrt[k]{u_k} = \lim_{k \to \infty}(u_k)^{\frac{1}{k}}$

if $\rho > 1$ then the series

► Converges
► **Diverges**
► May converge or diverge
► None of these

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

The series $\sum u_k \ and \ \sum v_k$ are convergent series then $(\sum u_k + \sum v_k) \ and \ (\sum u_k - \sum v_k)$ will be ……………and…………….

► Convergent, convergent
► Divergent, divergent
► **Convergent, divergent**
► Divergent, convergent

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

The notation $\{\frac{1}{2^n}\}^n_{-1}$ represents the sequence

► $2, 1, \dfrac{1}{2}, \dfrac{1}{4}, ...$

► $0, 1, 2, 3...$

$0, 1, \dfrac{1}{2}, \dfrac{1}{4}, ...$

►

► None of these

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

If

f is continuous on (a,b] but does not have a limit from the right then the integral

$$\int_a^b f(x)dx = \lim_{l \to a} \int_l^b f(x)dx$$

defined by   is called ………………. Integral

► Improper
► Proper
► None of these

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

An object is displaced 1m by a force of 1N then the work done W is

► 2
► 0
► None of these
► **1**

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

If

f is a smooth function on [a,b] then the arc length L of the curve y=f(x) from x=a to x=b will be

$$L = \int_a^b \sqrt{1 + [f'(x)]^2}\, dx$$

►

$$L = \int_a^b \sqrt{1 + [f'(x)]}\, dx$$

▶

$$L = \int_0^a \sqrt{1 + [f'(x)]}\, dy$$

▶

▶ None of these

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

If f is a smooth function on [0,3] then the arc length L of the curve y=f(x) from x=0 to x=3 will be

$$L = \int_0^3 \sqrt{1 + [f'(x)]^2}\, dx$$

▶

$$L = \int_a^b \sqrt{1 + [f'(x)]^2}$$

▶

$$L = \int_0^3 \sqrt{1 + [f'(x)]^2}\, dy$$

▶

▶ None of these

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

By using cylindrical shell to find volume of the solid when the region R in the first quadrant enclosed between $y = 3x$ and $y = 2x^2$ is revolved about the x-axis

$$V = \int_0^{\frac{3}{2}} 2\pi x (3x - 2x^2)\, dx$$

▶

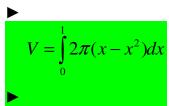$$V = \int_0^{\frac{3}{2}} x(3x - 2x^2)dx$$

▶

$$V = \int_0^{\frac{3}{2}} 2\pi(3x - 2x^2)dx$$

▶

▶ None of these

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

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

$$V = \int_0^3 2\pi x(x - x^2)dx$$

▶

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

▶

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

▶

▶ None of these

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

If

$$\int_a^a f(x)dx =$$

a is in the domain of f, then

▶ $f'(x)$

▶ $f(x)$

► **0**

► None of these

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

Consider the integral $\int\limits_{0}^{2} x^2 dx$, the area on right is bounded by
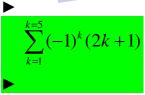
► $y = x^2$

► $x = 2$

► $x = 0$

► None of these

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

The series $1 - 3 + 5 - 7 + 9 - 11$ may written as in sigma notation

► $\sum\limits_{k=0}^{k=5} (-1)^k (2k+1)$

► $\sum\limits_{k=1}^{k=5} (-1)^k (2k+1)$

► $\sum\limits_{k=1}^{k=5} (2k+1)$

► None of these

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

$4^2 + 5^2 + 6^2 + 7^2$ in sigma notation may be represented as

$$\sum_{k=2}^{k=7} k^2$$

►

$$\sum_{k=2}^{k=7} (k+1)^2$$

►

$$\sum_{k=4}^{k=7} k^2$$

►

► None of these

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

If a function f is ……….. on a closed interval [a,b] ,then f has both a maximum and minimum value on [a,b]

► **Continuous**
► Discontinuous
► Differentiable
► None of these

Question No: 18   (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: 19   (Marks: 1)   - Please choose one

If a function satisfies the conditions

f(c) is defined

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

Exists

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

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: 20   (Marks: 1)   - Please choose one

For a function f(x) to be continuous on interval (a,b) the function must be continuous

► **At all point in (a,b)**
► Only at a and b
► At mid point of a and b
► None of these

Question No: 21   (Marks: 2)

$$a_{n+1} = \frac{1}{3}(a_n + \frac{1}{a_n}) \; for \; n \geq 1 \; and \; a_1 = 2$$

Write down the first two term of the sequence

Question No: 22   (Marks: 2)

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

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

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

Question No: 23   (Marks: 2)

$$\int\limits_{2}^{5} f(x)dx \qquad \int\limits_{2}^{3} f(x)dx = 7, \int\limits_{3}^{4} f(x)dx = 2, \int\limits_{5}^{4} f(x)dx = 5$$

Calculate   if

$$\int\limits_{2}^{3} f(x)dx = 7, \int\limits_{3}^{4} f(x)dx = 2, \int\limits_{5}^{4} f(x)dx = 5$$

$$\int\limits_{2}^{5} f(x)dx = 7 + 2 - 5 = 4$$

Question No: 24   (Marks: 3)

Find the first two Taylor polynomials for $\ln x$ about $x = 3$

Question No: 25   (Marks: 3)

Let the curve $y = x^{\frac{3}{2}} ; \quad 0 \le y \le 2$, then find the surface area generated by revolving the curve. (But do not evaluate)

Question No: 26   (Marks: 3)

$$\frac{1}{1} + \frac{1}{4} + \frac{1}{9} + \ldots\ldots + \frac{1}{7225}$$

Express the sum   in sigma notation but do not evaluate.

$$\frac{1}{1} + \frac{1}{4} + \frac{1}{9} + \ldots\ldots + \frac{1}{7225}$$

$$\sum_{k=1}^{7225} k^3 + 1$$

Question No: 27   (Marks: 5)

Find the first four nonzero terms of the Taylor series generated by f at $x = a$

$$f(x) = \frac{1}{1-x} \quad at \quad x = 2$$

Question No: 28   (Marks: 5)

Evaluate the Definite Integral using the First fundamental Theorem of Calculus

$$\int_0^1 (x^5 - x^3 + 2x)\,dx$$
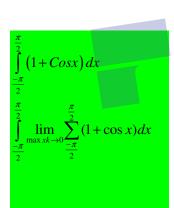
$Let\ u = (x^5 - x^3 + 2x)$

$$\int_0^1 (u)\,dx$$

Question No: 29   (Marks: 5)

Express the definite integrals as limits (Do not evaluate the integrals)

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} (1 + Cosx)\,dx$$

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} (1 + Cosx)\,dx$$

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \lim_{\max xk \to 0} \sum_{\frac{-\pi}{2}}^{\frac{\pi}{2}} (1 + \cos x)\,dx$$

Question No: 30   (Marks: 10)

Find the region enclosed by the curves and also find the area

$$y = x^2 \ , \ y = \sqrt{x} \ , \ x = \frac{1}{4} \ , \quad x = 1$$

Question No: 31   (Marks: 10)

Use x^*_k as the left end point of each subinterval to find the area under

$y = mx \ \ over \ the \ \mathrm{int} erval \left[a,b\right], where \ m > 0 \ and \ a \geq 0$

Solution on next page

$Suppose \ \ a = 1 \ b = 2 \ so [a,b] = [1,2]$

$x_k{}^* = x_{k-1} = a + (k-1)\Delta x \quad (formula \ for \ left \ end \ po \mathrm{int})$

$\Delta x = \dfrac{b-a}{n} = \dfrac{2-1}{n} = \dfrac{1}{n}$

$Suppose \ \ kth \ \ has \ \ area$

$f(x_{k*})\Delta x = x_{k*}\Delta x$

$\left[1 + \dfrac{k}{n}\right]\Delta x$

$\left[1 + \dfrac{k}{n}\right]\dfrac{1}{n}$

$\displaystyle\sum_{k=1}^{n} f(x_{k*})\Delta x = \sum_{k=1}^{n}\left[1 + k - 1\right]$

$Area \ by \ solving$

$A = \displaystyle\lim_{\delta x \to 0}\sum_{k=1}^{n} f(x_{k*})\Delta x = \lim_{\delta x \to 0}\left[\dfrac{3}{2} - 1 + \dfrac{1}{2n}\right]$

$\qquad\qquad\qquad = \dfrac{3}{2} - 1 + 0$

This paper is solved by our best knowledge. In the case of any error/correction/suggestion, please contact at gulshanvu@yahoo.com, with reference to the concerned paper's number.

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