**FINALTERM  EXAMINATION**
Fall 2009
MTH301- Calculus II

Time: 120 min
Marks: 80

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

$\pi$ is an example of -----------

▶ Irrational numbers

▶ Rational numbers

▶ Integers

▶ Natural numbers

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

Straight line is a special kind of ----------------

▶ Surface

▶ Curve

▶ Plane

▶ Parabola

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

An ordered triple corresponds to ----------- in three dimensional space.

► A unique point

► A point in each octant

► Three points

► Infinite number of points

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

The angles which a line makes with positive x ,y and z-axis are known as ------------

► Direction cosines

► Direction ratios

► Direction angles

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

Is the function $f(x, y)$ continuous at origin? If not, why?

$f(x, y) = 4xy + \sin 3x^2 y$

► $f(x, y)$ is continuous at origin

► $f(0, 0)$ is not defined

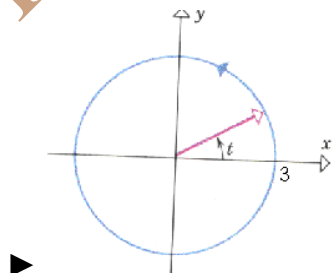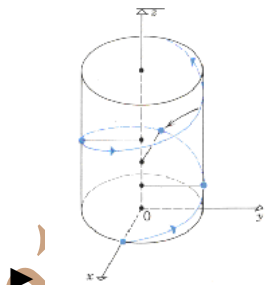► $f(0, 0)$ is defined but $\lim\limits_{(x, y) \to (0, 0)} f(x, y)$ does not exist
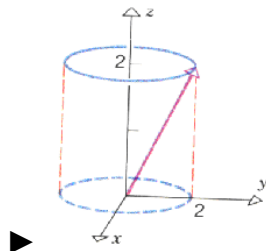
► $f(0, 0)$ is defined and $\lim\limits_{(x, y) \to (0, 0)} f(x, y)$ exists but these two numbers are not equal.
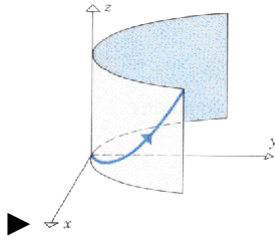
**Question No: 6     ( Marks: 1 ) - Please choose one**

Match the following vector-valued function with its graph.

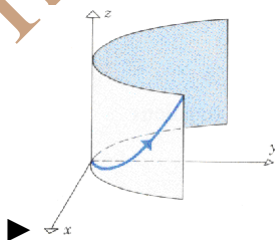$r(t) = 3\cos t \, \hat{i} + 3\sin t \, \hat{j}$  and  $0 \le t \le 2\pi$
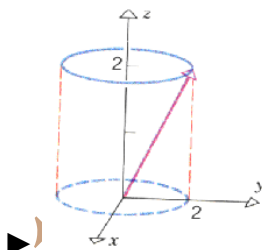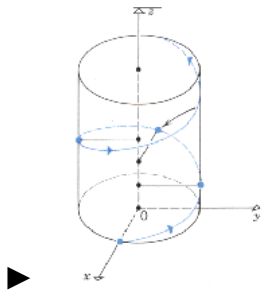
►

►

►

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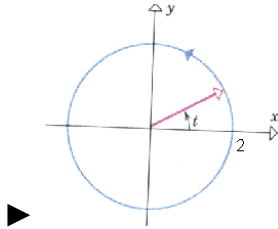
**Question No: 7     ( Marks: 1 ) - Please choose one**

Match the following vector-valued function with its graph.

$$r(t) = t\,\hat{i} + t^2\,\hat{j} + t^3\,\hat{k} \quad \text{and} \quad t \geq 0$$



▶



▶



▶

►

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

What are the parametric equations that correspond to the following vector equation?

$$\vec{r}(t) = \sin^2 t\ \hat{i} + (1 - \cos 2t)\ \hat{j}$$

► $x = \sin^2 t$   ,   $y = 1 - \cos 2t$   ,   $z = 0$

► $y = \sin^2 t$   ,   $x = 1 - \cos 2t$   ,   $z = 0$

► $x = \sin^2 t$   ,   $y = 1 - \cos 2t$   ,   $z = 1$

► $x = \sin^2 t$   ,   $y = \cos 2t$   ,   $z = 1$

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

Is the following vector-valued function $\vec{r}(t)$ continuous at $t = 0$? If not, why?

$$\vec{r}(t) = (4\cos t,\ \sqrt{t}\ ,\ 4\sin t)$$

► $\vec{r}(0)$ is not defined

► $\vec{r}(0)$ is defined but $\lim\limits_{t \to 0} \vec{r}(t)$ does not exist

► $\vec{r}(0)$ is defined and $\lim\limits_{t \to 0} \vec{r}(t)$ exists but these two numbers are not equal.

► $\vec{r}(t)$ is continuous at $t = 0$

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

What is the derivative of following vector-valued function?
$$\vec{r}(t) = (\cos 5t, \ \tan t \ , \ 6\sin t)$$

► $\vec{r}'(t) = \left( \dfrac{\sin 5t}{5}, \ \sec t \ , \ 6\cos t \right)$

► $\vec{r}'(t) = (\dfrac{-\sin 5t}{5}, \ \sec t \ , \ 6\cos t)$

► $\vec{r}'(t) = (-5\sin 5t, \ \sec^2 t \ , \ 6\cos t)$

► $\vec{r}'(t) = (\sin 5t, \ \sec^2 t \ , \ -6\cos t)$

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

The following differential is exact

$$dz = (3x^2 y + 2) \, dx + (x^3 + y) \, dy$$

► True

► False

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

The following differential is exact
$$dz = (3x^2 + 4xy) \, dx + (2x^2 + 2y) \, dy$$

► True

► False

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

Which one of the following is correct Wallis Sine formula when $n$ is odd and $n \geq 3$?

$$\int_0^{\frac{\pi}{2}} \sin^n x \, dx = \frac{\pi}{2} \frac{(n-1)}{n} \frac{(n-3)}{(n-2)} \frac{(n-5)}{(n-4)} - - - - - - \frac{5}{6} \frac{3}{4} \frac{1}{2}$$

►

$$\int_0^{\frac{\pi}{2}} \sin^n x \, dx = \frac{\pi}{2} \frac{(n)}{(n-1)} \frac{(n-2)}{(n-3)} \frac{(n-4)}{(n-5)} - - - - - - \frac{6}{5} \frac{4}{3} \frac{2}{1}$$

►

$$\int_0^{\frac{\pi}{2}} \sin^n x \; dx = \frac{(n-1)}{n} \frac{(n-3)}{(n-2)} \frac{(n-5)}{(n-4)} -------\frac{6}{7} \frac{4}{5} \frac{2}{3}$$

►

$$\int_0^{\frac{\pi}{2}} \sin^n x \; dx = \frac{(n)}{(n-1)} \frac{(n-2)}{(n-3)} \frac{(n-4)}{(n-5)} -------\frac{6}{5} \frac{4}{3} \frac{2}{1}$$

►

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

Which of the following is correct?

$$\int_0^{\frac{\pi}{2}} \sin^4 x \; dx = \frac{3}{16}$$

►

$$\int_0^{\frac{\pi}{2}} \sin^4 x \; dx = \frac{3\pi}{16}$$

►

$$\int_0^{\frac{\pi}{2}} \sin^4 x \; dx = \frac{3}{8}$$

►

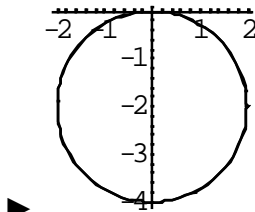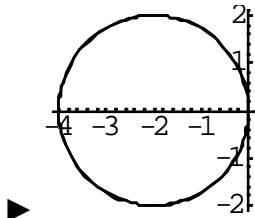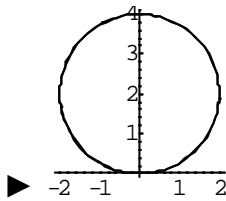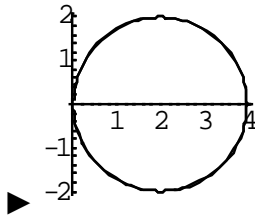$$\int_0^{\frac{\pi}{2}} \sin^4 x \; dx = \frac{2\pi}{3}$$

►

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

Match the following equation in polar co-ordinates with its graph.
$r = 4\sin\theta$

▶

▶

▶

▶

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

If the equation of a curve, in polar co-ordinates, remains unchanged after replacing
$(r, \theta)$ by $(r, \pi - \theta)$ then the curve is said to be symmetric about which of the following?

► Initial line

► y-axis

► Pole

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

$$f(x) = \sin \frac{x}{2}$$

What is the period of a periodic function defined by                    ?
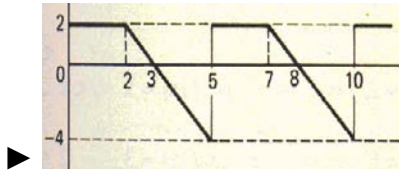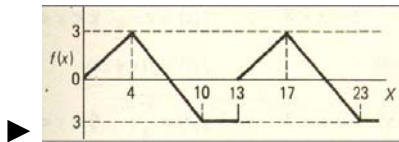
► $\dfrac{\pi}{2}$

► $\pi$

► $\dfrac{3\pi}{2}$

► $4\pi$

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

Match the following periodic function with its graph.
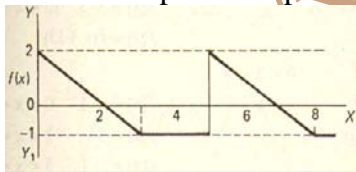
$$f(x) = \begin{cases} \dfrac{3}{4}x & 0 < x < 4 \\ 7 - x & 4 < x < 10 \\ -3 & 10 < x < 13 \end{cases}$$
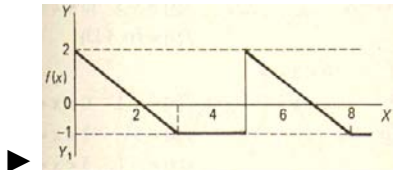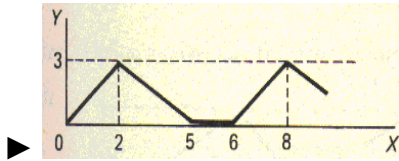
**Question No: 19     ( Marks: 1 ) - Please choose one**

What is the period of periodic function whose graph is as below?



► 2

► 3

► 4

► 5

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

What is the period of periodic function whose graph is as below?
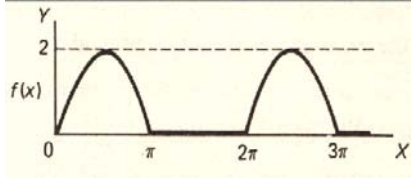


► 0

► 2

► $\pi$

► $2\pi$

**Question No: 21     ( Marks: 1 ) - Please choose one**

Polar co-ordinates of a point are $\left(-2, \dfrac{-3\pi}{2}\right)$. Which of the following is another possible polar co-ordinates representation of this point?

$\left(2, \dfrac{-\pi}{4}\right)$

►

$\left(2, \dfrac{-\pi}{2}\right)$

►

$\left(2, \dfrac{-\pi}{3}\right)$

►

$$\left(2, \frac{3\pi}{4}\right)$$

►

**Question No: 22     ( Marks: 1 ) - Please choose one**

The function $f(x) = x^3 e^x$ is -------------

►  Even function

►  Odd function

►  Neither even nor odd

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

The graph of an even function is symmetrical about ---------------

►  x-axis

►  y-axis

►  origin

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

At which point the vertex of parabola, represented by the equation $y = x^2 - 4x + 3$, occurs?

►  (0, 3)

▶ $(2, -1)$

▶ $(-2, 15)$

▶ $(1, 0)$

**Question No: 25     ( Marks: 1 ) - Please choose one**

The equation $y = x^2 - 4x + 2$ represents a parabola. Find a point at which the vertex of given parabola occurs?

▶ $(2, -2)$

▶ $(-4, 34)$

▶ $(0, 0)$

▶ $(-2, 14)$

**Question No: 26     ( Marks: 1 ) - Please choose one**

Is the function $f(x, y)$ continuous at origin? If not, why?

$$f(x, y) = \frac{xy}{x^2 + y^2}$$

▶ $f(x, y)$ is continuous at origin

▶ $\lim_{(x, y) \to (0, 0)} f(x, y)$ does not exist

► $f(0, 0)$ is defined and $\lim\limits_{(x, y) \to (0, 0)} f(x, y)$ exists but these two numbers are not equal.

**Question No: 27      ( Marks: 1 ) - Please choose one**

Sign of line integral is reversed when -----------

► path of integration is divided into parts.

► path of integration is parallel to y-axis.

► direction of path of integration is reversed.

► path of integration is parallel to x-axis.

**Question No: 28      ( Marks: 1 ) - Please choose one**

What is Laplace transform of a function F(t)?

(s is a constant)

► $\int\limits_0^s e^{-st} F(t)\, dt$

► $\int\limits_0^\infty e^{st} F(t)\, dt$

► $\int\limits_{-\infty}^\infty e^{-st} F(t)\, dt$

► $\int\limits_0^\infty e^{-st} F(t)\, dt$

**Question No: 29      ( Marks: 1 ) - Please choose one**

What is the value of $L\{e^{5t}\}$ if $L$ denotes laplace transform?

▶ $L\{e^{5t}\} = \dfrac{1}{s-5}$

▶ $L\{e^{5t}\} = \dfrac{s}{s^2+25}$

▶ $L\{e^{5t}\} = \dfrac{5}{s^2+25}$

▶ $L\{e^{5t}\} = \dfrac{5!}{s^6}$

**Question No: 30      ( Marks: 1 ) - Please choose one**

What is the Laplace Inverse Transform of $\dfrac{1}{s+1}$

▶ $L^{-1}\left\{\dfrac{1}{s+1}\right\} = t+1$

▶ $L^{-1}\left\{\dfrac{1}{s+1}\right\} = e^{-t}+e^{t}$

▶ $L^{-1}\left\{\dfrac{1}{s+1}\right\} = e^{t}$

▶ $L^{-1}\left\{\dfrac{1}{s+1}\right\} = e^{-t}$

**Question No: 31     ( Marks: 1 ) - Please choose one**

What is Laplace Inverse Transform of $\dfrac{5}{s^2+25}$

▶ $L^{-1}\left\{\dfrac{5}{s^2+25}\right\} = \sin 5t$

▶ $L^{-1}\left\{\dfrac{5}{s^2+25}\right\} = \cos 5t$

▶ $L^{-1}\left\{\dfrac{5}{s^2+25}\right\} = \sin 25t$

▶ $L^{-1}\left\{\dfrac{5}{s^2+25}\right\} = \cos 25t$

**Question No: 32     ( Marks: 1 ) - Please choose one**

What is $L\{-6\}$ if $L$ denotes Laplace Transform?

▶ $L\{-6\} = \dfrac{1}{s+6}$

▶ $L\{-6\} = \dfrac{-6}{s}$

▶ $L\{-6\} = \dfrac{s}{s^2+36}$

▶ $L\{-6\} = \dfrac{-6}{s^2 + 36}$

**Question No: 33     ( Marks: 1 ) - Please choose one**

$$\int_C (3x + 2y)\ dx + (2x - y)\ dy$$

Evaluate the line integral                                                        where C is the line segment from (0, 0) to (2, 0).

▶ 6

▶ -6

▶ 0

▶ Do not exist

**Question No: 34     ( Marks: 1 ) - Please choose one**

$$\int_C (2x + y)\ dx + (x^2 - y)\ dy$$

Evaluate the line integral                                                        where C is the line segment from (0, 0) to (0, 2).

▶ -4

▶ -2

▶ 0

▶ 2

**Question No: 35     ( Marks: 1 ) - Please choose one**

Plane is an example of ----------------------

► Curve

► Surface

► Sphere

► Cone

**Question No: 36     ( Marks: 1 ) - Please choose one**

$If\ R = \{(x, y) / 0 \le x \le 2\ and -1 \le y \le 1\}, then$

$\iint\limits_{R} (x + 2y^2) dA =$

$\int\limits_{-1}^{1} \int\limits_{0}^{2} (x + 2y^2) dy dx$

►

$\int\limits_{0}^{2} \int\limits_{1}^{-1} (x + 2y^2) dx dy$

►

$$\int_{-1}^{1} \int_{0}^{2} (x + 2y^2)\,dxdy$$

►

$$\int_{1}^{2} \int_{-1}^{0} (x + 2y^2)\,dxdy$$

►

**Question No: 37      ( Marks: 1 ) - Please choose one**

To evaluate the line integral, the integrand is expressed in terms of x, y, z with

►   $dr = dx\,\hat{i} + dy\,\hat{j}$

►   $dr = dx\,\hat{i} + dy\,\hat{j} + dy\,\hat{k}$
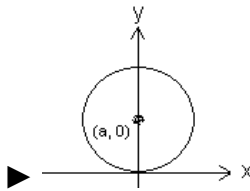
►   $dr = dx + dy + dz$

►   $dr = dx + dy$
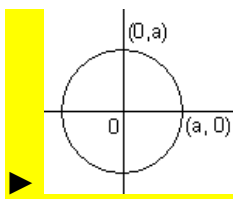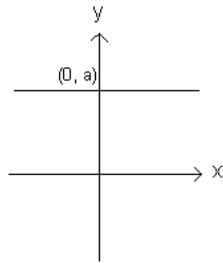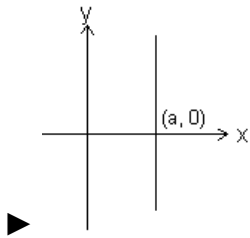
**Question No: 38      ( Marks: 1 ) - Please choose one**

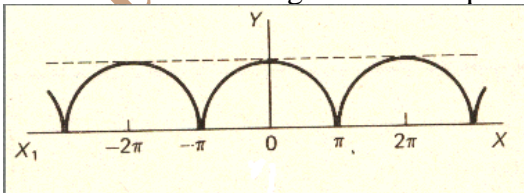Match the following equation in polar co-ordinates with its graph.
$r = a$

where *a* is an arbitrary constant.

▶



▶



▶



▶

**Question No: 39    ( Marks: 1 ) - Please choose one**

Which of the following is true for a periodic function whose graph is as below?
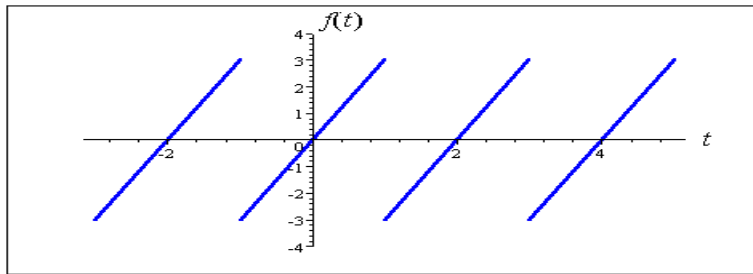


▶ Even function

▶ Odd function

► Neither even nor odd function

**Question No: 40     ( Marks: 1 ) - Please choose one**



The graph of "saw tooth wave" given above is --------------

► An odd function

► An even function

► Neither even nor odd

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

Laplace transform of 't' is

►    $\dfrac{1}{s}$

► $\dfrac{1}{s^2}$

► $e^{-s}$

► $s$

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

Symmetric equation for the line through (1,3,5) and (2,-2,3) is

► $x - 2 = -\dfrac{y+2}{3} = -\dfrac{z-3}{5}$

► $x + 2 = -\dfrac{y+3}{5} = -\dfrac{z+5}{2}$

► $x - 1 = -\dfrac{y-3}{5} = -\dfrac{z-5}{2}$

► $x + 1 = \dfrac{y+3}{5} = \dfrac{z-5}{5}$

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

The level curves of f(x, y) = y Cscx  are parabolas.

► True.

► False.

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

The equation $z = r$ is written in

► Rectangular coordinates

► Cylindrical coordinates

►     Spherical coordinates

►     <mark>None of the above</mark>