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

Intersection of two straight lines is ----------

- Surface
- Curve
- Plane
- *Point*

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

Plane is a ---------- surface.

- One-dimensional
- *Two-dimensional*
- Three-dimensional
- Dimensionless

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

Let w = f(x, y, z) and x = g(r, s), y = h(r, s), z = t(r, s) then by chain rule

$\frac{\partial w}{\partial r} =$

- $\frac{\partial w}{\partial x}\frac{\partial x}{\partial r}+\frac{\partial w}{\partial y}\frac{\partial y}{\partial r}+\frac{\partial w}{\partial z}\frac{\partial z}{\partial r}$
- $\frac{\partial w}{\partial r}\frac{\partial x}{\partial r}+\frac{\partial w}{\partial r}\frac{\partial y}{\partial r}+\frac{\partial w}{\partial r}\frac{\partial z}{\partial r}$
- $\frac{\partial w}{\partial x}\frac{\partial x}{\partial r}\frac{\partial x}{\partial s}+\frac{\partial w}{\partial y}\frac{\partial y}{\partial r}\frac{\partial y}{\partial s}+\frac{\partial w}{\partial z}\frac{\partial z}{\partial r}\frac{\partial z}{\partial s}$
- $\frac{\partial w}{\partial r}\frac{\partial r}{\partial x}+\frac{\partial w}{\partial r}\frac{\partial r}{\partial y}+\frac{\partial w}{\partial r}\frac{\partial r}{\partial z}$

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

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

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

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

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

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

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

$r(t) = (2t-1)\,\hat{i} - 3\sqrt{t}\,\hat{j} + \sin 3t\,\hat{k}$

- $z = 2t-1 \quad , \quad x = -3\sqrt{t} \quad , \quad y = \sin 3t$
- $y = 2t-1 \quad , \quad x = -3\sqrt{t} \quad , \quad z = \sin 3t$
- $x = 2t-1 \quad , \quad z = -3\sqrt{t} \quad , \quad y = \sin 3t$
- $x = 2t-1 \quad , \quad y = -3\sqrt{t} \quad , \quad z = \sin 3t$

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

What is the derivative of following vector-valued function?

$\vec{r}(t) = (\cos 5t,\ \tan t\ ,\ 6\sin t)$

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

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

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

What is the derivative of following vector-valued function?

$\vec{r}(t) = \left(t^4, \sqrt{t+1}, \frac{3}{t^2}\right)$

- $\vec{r}'(t) = \left(4t^3, \frac{1}{\sqrt{t+1}}, \frac{-6}{t^3}\right)$
- $\vec{r}'(t) = \left(4t^3, \frac{1}{2\sqrt{t+1}}, \frac{6}{t^3}\right)$
- $\vec{r}'(t) = \left(4t^4, \frac{1}{2\sqrt{t+1}}, \frac{-6}{t^3}\right)$
- $\vec{r}'(t) = \left(4t^3, \frac{1}{2\sqrt{t+1}}, \frac{-6}{t^3}\right)$

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

The following differential is exact

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

- True
- False

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

Which one of the following is correct Wallis Sine formula when n is even and $n \geq 2$?

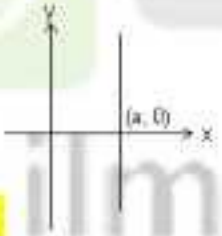
- $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{\pi}{2}\frac{(n-1)}{n}\frac{(n-3)}{(n-2)}\frac{(n-5)}{(n-4)}\cdots\cdots\frac{5}{6}\frac{3}{4}\frac{1}{2}$ page #182
- $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{(n-1)}{n}\frac{(n-3)}{(n-2)}\frac{(n-5)}{(n-4)}\cdots\frac{6}{7}\frac{4}{5}\frac{2}{3}$
- $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{\pi}{2}\frac{(n)}{(n-1)}\frac{(n-2)}{(n-3)}\frac{(n-4)}{(n-5)}\cdots\cdots\frac{6}{5}\frac{4}{3}\frac{2}{1}$
- $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{(n)}{(n-1)}\frac{(n-2)}{(n-3)}\frac{(n-4)}{(n-5)}\cdots\cdots\frac{6}{5}\frac{4}{3}\frac{2}{1}$

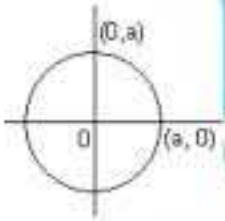
Question No: 10 (Marks: 1) - Please choose one

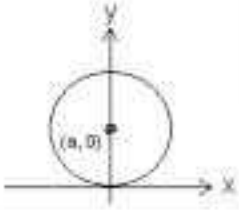
Match the following equation in polar co-ordinates with its graph.

$r\cos\theta = a$

where a is an arbitrary cons tant







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

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

► Initial line

► Y-axis

► Pole

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

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

► Initial line

► y-axis

► *Pole*

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

What is the amplitude of a periodic function defined by $f(x) = \sin\frac{x}{3}$?

► 0

► 1

- $\frac{1}{3}$
- Does not exist

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

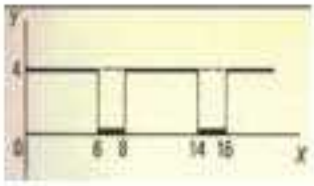
What is the period of a periodic function defined by $f(x) = 4\cos 3x$?

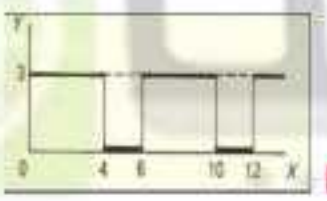
- $\frac{\pi}{4}$
- $\frac{\pi}{3}$
- $\frac{2\pi}{3}$
- π

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

Match the following periodic function with its graph.

$$f(x) = \begin{cases} 3 & 0 < x < 4 \\ 0 & 4 < x < 6 \end{cases}$$

- 



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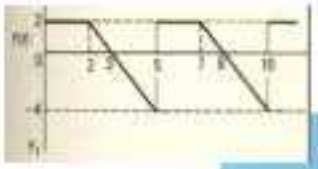

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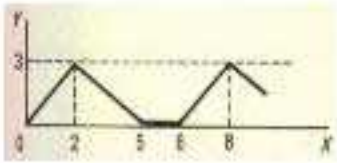
Question No: 16 (Marks: 1) - Please choose one

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



► 2

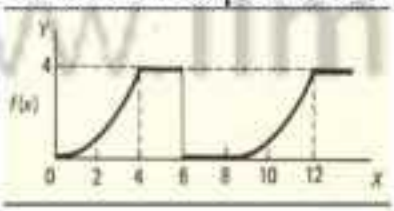
► 5

► 6

► 8

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

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



- 0
- 4
- 6
- 8

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

Let L denotes the Laplace Transform.

If $L\{F(t)\} = f(s)$ where s is a constant.and $\lim_{t\to 0}\left(\frac{F(t)}{t}\right)$ exists then which of the following equation holds?

- $L\left(\frac{F(t)}{t}\right) = f(s+a)$
- $L\left(\frac{F(t)}{t}\right) = f(s-a)$

- $L\left(\frac{F(t)}{t}\right)=\int_s^{\infty} f(s)\,ds$
- $L\left(\frac{F(t)}{t}\right)=-\frac{d}{ds}\{f(s)\}$

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

Which of the following is Laplace inverse transform of the function $f(s)$ defined by $f(s)=\frac{3}{s-2}-\frac{2}{s}$?

- $3te^{2t}-2$
- $3e^{2t}-2t$
- $3e^{2t}-2$
- None of these.

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

Let (x_1, y_1, z_1) and (x_2, y_2, z_2) be any two points in three dimensional space. What does the formula $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$ calculates?

- Distance between these two points

- Midpoint of the line joining these two points
- Ratio between these two points

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

Let the functions $P(x, y)$ and $Q(x, y)$ are finite and continuous inside and at the boundary of a closed curve C in the xy-plane. If $(P\,dx + Q\,dy)$ is an exact differential then

$\oint_C (P\,dx + Q\,dy) =$

- Zero
- One
- Infinite

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

What is Laplace transform of the function $F(t)$ if $F(t) = t$?

- $L\{t\} = \frac{1}{s}$
- $L\{t\} = \frac{1}{s^2}$

- $L\{t\} = e^{-t}$
- $L\{t\} = s$

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

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

- $L\{e^{5t}\} = \frac{1}{s-5}$
- $L\{e^{5t}\} = \frac{s}{s^2+25}$
- $L\{e^{5t}\} = \frac{5}{s^2+25}$
- $L\{e^{5t}\} = \frac{5!}{s^6}$

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

Evaluate the line integral $\int_C (3x+2y)\,dx+(2x-y)\,dy$ where C is the line segment from (0, 0) to (0, 2).

- 1
- 0

► 2

► -2

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

Evaluate the line integral $\int_C (2x+y)\,dx+(x^2-y)\,dy$ where C is the line segment from (0, 0) to (2, 0).

► 0

► -4

► 4

► Do not exist

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

Which of the following are direction ratios for the line joining the points $(1, 3, 5)$ and $(2, -1, 4)$?

► 3, 2 and 9

► 1, -4 and -1

► 2, -3 and 20

► 0.5, -3 and 5/4

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

If $R = \{(x, y) / 0 \le x \le 2 \text{ and } 1 \le y \le 4\}$, then

$\iint_R (6x^2 + 4xy^3)dA =$

► $\int_1^4 \int_0^2 (6x^2 + 4xy^3)dydx$

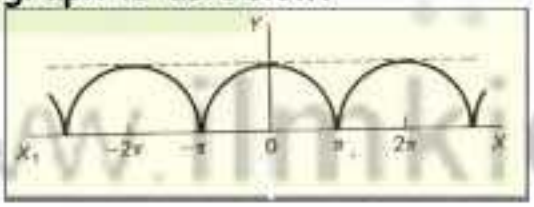
► $\int_0^2 \int_1^4 (6x^2 + 4xy^3)dxdy$

► $\int_1^4 \int_0^2 (6x^2 + 4xy^3)dxdy$

► $\int_2^4 \int_0^1 (6x^2 + 4xy^3)dxdy$

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

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

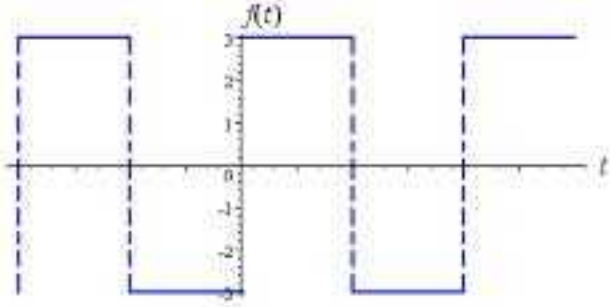


► Even function page209

► Odd function

► Neither even nor odd function

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



Which of the following is true for a function whose graph is given above.

► An odd function pg 212

- An even function
- Neither even nor odd

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

At each point of domain, the function ----------

- **Is defined**
- Is continuous
- Is infinite
- Has a limit

Question No: 31 (Marks: 2)

Determine whether the following differential is exact or not.

$dz = 4x^3y^3\,dx + 3x^4y^2\,dy$

Solution:

$$dz = 4x^3y^3\ dx + 3x^4y^2\ dy$$

$$\frac{\partial p}{\partial y} = 12x^3y^2$$

$$\frac{\partial Q}{\partial X} = 12x^3y^2$$

$$\frac{\partial p}{\partial y} = \frac{\partial Q}{\partial X}$$

yes

Question No: 32 (Marks: 2)

Evaluate

$$\int_{-\pi}^{\pi} \sin nx\ dx$$

where n is an integer other than zero.

Solution:

$$\int_{-\pi}^{\pi} \sin nx\ dx$$

$$= \left[\frac{-\cos nx}{n}\right]_{-\pi}^{\pi}$$

$$= \left[\frac{-\cos n\pi}{n} + \frac{\cos n\pi}{n}\right]$$

$$= \frac{1}{n}(-\cos n\pi + \cos n\pi)$$

$$= 0$$

Question No: 33 (Marks: 2)

Find Laplce transform of the function $F(t)$ if $F(t) = e^{3t}$

Solution:

$$L(e^{3t}) = \int_0^{\infty} e^{3t} - e^{-st}$$

$$= \int_0^{\infty} e^{-(s-3)t}\, dt$$

$$= \{\frac{e^{-(s-3)t}}{-(s-3)}\} \lim 0 - \infty$$

$$= \frac{-1}{s-3}(\frac{1}{e^{(s-3)t}})$$

$$= \frac{-1}{s-3}(0-1)$$

$$= \frac{1}{s-3} \text{.....Ans}$$

Question No: 34 (Marks: 3)

Determine the Fourier co-efficient a_n of the periodic function defined below:

$f(x) = 2x+1 \qquad 0 < x < 2$

Solution:

$a_n = \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)dx$

$f(x) = (2x+1)$

$(0,2)$

$= \int_0^2 (2x+1)dx$

$= \left[x^2 + x\right]_0^2$

$= 6$

Question No: 35 (Marks: 3)

Determine whether the following differential is exact or not.

$$dz = (3x^2e^{2y} - 2y^2e^{3x})\,dx + (2x^3e^{2y} - 2ye^{3x})\,dy$$

Solution:

dz = Pdx + Qdy

Therefore,

For dz to be an exact differential it must satisfy $\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}$

But this test fails becuase $\frac{\partial P}{\partial y} \neq \frac{\partial Q}{\partial x}$

Not Exact

Question No: 36 (Marks: 3)

Use Wallis sine formula to evaluate $\int_0^{\frac{\pi}{2}} \{\sin^3 x + \sin^5 x\}\,dx$

Solution:

$$\int_0^{\frac{\pi}{2}} \sin^3 x dx$$
$$= \frac{n-1}{n}.$$
$$= \frac{3-1}{3}$$
$$= \frac{2}{3}$$
$$\int_0^{\frac{\pi}{2}} \sin^5 x dx$$
$$= \frac{n-1}{n}.\frac{n-3}{n-2}$$
$$= \frac{5-1}{5}.\frac{5-3}{5-2}$$
$$= \frac{4}{5}.\frac{2}{3}$$
$$\int_0^{\frac{\pi}{2}} \left(\sin^3 x + \sin^5 x\right) dx$$
$$= \frac{2}{3} + \frac{4}{5}.\frac{2}{3}$$

Question No: 37 (Marks: 5)

Evaluate the following line integral which is independent of path.

$$\int_{(0,0)}^{(3,2)} (2xe^y)\,dx + (x^2e^y)\,dy$$

Solution:

$$p = \frac{\partial z}{\partial x} = 2e^y \qquad \int 2e^y dx$$

$$Q = \frac{\partial z}{\partial y} = x^2 e^y \qquad \int x^2 e^y dy$$

$$z = \int_{(0,0)}^{(3,2)} 2xe^y + x^2 ye^y$$

$$z = 6e^2 + 18e^2$$

$$z = 24e^2$$

Question No: 38 (Marks: 5)

Determine the Fourier coefficients b_n for a periodic function $f(t)$ of period 2 defined by

$$f(t) = \begin{cases} 4\,(1+t) & -1 < t < 0 \\ 0 & 0 < t < 1 \end{cases}$$

Solution:

$$bn = \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\sin nx dx$$

$$= \frac{1}{\pi}\int_{-1}^{1} 4(1+t)\sin nx dx$$

$$= \frac{1}{\pi}\left[\frac{-4(1+t)\cos nx}{n}\right]_{-1}^{1}$$

$$= \frac{-4(1+t)}{\pi n}\left[\cos n(1) - \cos n(-1)\right]$$

$$= \frac{-4(1+t)}{\pi n}(\cos n + \cos n)$$

Question No: 39 (Marks: 5)

Determine whether the following vector field $\vec{F}$ is conservative or not.

$$\vec{F}(x, y, z) = (4x - z)\hat{i} + (3y + z)\hat{j} + (y - x)\hat{k}$$

.....

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

---------- planes intersect at right angle to form three dimensional space.

- ► Three
- ► Four
- ► Eight
- ► Twelve

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

If the positive direction of x, y axes are known then ---------- the positive direction of z-axis.

- ► Horizontal rightward direction is
- ► Vertical upward direction is
- ► **Left hand rule tells**
- ► Right hand rule tells

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

What is the distance between points (3, 2, 4) and (6, 10, -1)?

- ► $7\sqrt{2}$
- ► $2\sqrt{6}$
- ► $\sqrt{34}$
- ► $7\sqrt{3}$

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

The equation $ax+by+cz+d=0$, where a,b,c,d are real numbers, is the general equation of which of the following?

- Plane page # 12
- Line
- Curve
- Circle

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

The spherical co-ordinates of a point are $\left(\sqrt{3}, \frac{\pi}{3}, \frac{\pi}{2}\right)$. What are its cylindrical co-ordinates?

- $\left(\frac{\sqrt{3}}{2}, \frac{3}{2}, 0\right)$
- $\left(\sqrt{3}\cos\frac{\pi}{3}, \sqrt{3}\sin\frac{\pi}{3}, 0\right)$
- $\left(\sqrt{3}\sin\frac{\pi}{3}, \frac{\pi}{2}, \sqrt{3}\cos\frac{\pi}{3}\right)$
- $\left(\sqrt{3}, \frac{\pi}{3}, 0\right)$

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

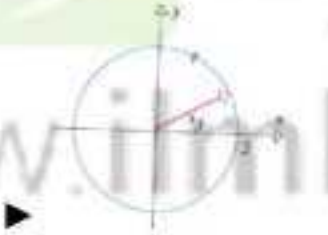
Domain of the function $f(x, y)=\sqrt{y-x^2}$ is

- $y<x^2$
- $y\geq x^2$
- $y\neq x^2$
- Entire space

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

Match the following vector-valued function with its graph.

$r(t) = \cos t\, i + \sin t\, j + 2k$ And $0 \le t \le 2\pi$



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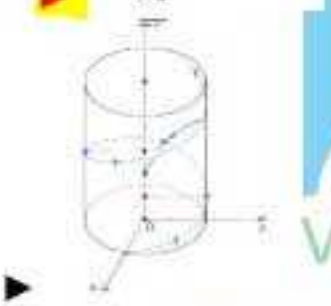
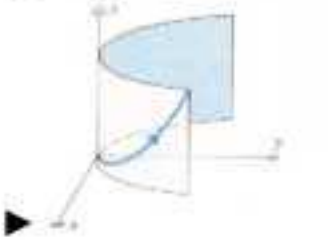




Question No: 8 (Marks: 1) - Please choose one

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

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

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

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

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

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

$r(t) = (2t-1)\,i - 3\sqrt{t}\,j + \sin 3t\,k$

- $z = 2t-1 \quad , \quad x = -3\sqrt{t} \quad , \quad y = \sin 3t$
- $y = 2t-1 \quad , \quad x = -3\sqrt{t} \quad , \quad z = \sin 3t$
- $x = 2t-1 \quad , \quad z = -3\sqrt{t} \quad , \quad y = \sin 3t$
- $x = 2t-1 \quad , \quad y = -3\sqrt{t} \quad , \quad z = \sin 3t$

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

Is the following vector-valued function $\vec{r}(t)$ continuous at $t = 1$?

If not, why?

$\vec{r}(t) = \left(\frac{t+1}{t-1}, t^2, 2t \right)$

- $\vec{r}(t)$ is continuous at $t = 1$
- $\vec{r}(1)$ is not defined
- $\vec{r}(1)$ is defined but $\lim_{t \to 1} \vec{r}(t)$ does not exist
- **$\vec{r}(1)$ is defined and $\lim_{t \to 1} \vec{r}(t)$ exists but these two numbers are not equal.**

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

Which one of the following is correct Wallis Sine formula when n is even and $n \geq 2$?

- $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{\pi}{2}\frac{(n-1)}{n}\frac{(n-3)}{(n-2)}\frac{(n-5)}{(n-4)}\cdots\cdots\frac{5}{6}\frac{3}{4}\frac{1}{2}$ page183
- $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{(n-1)}{n}\frac{(n-3)}{(n-2)}\frac{(n-5)}{(n-4)}\cdots\cdots\frac{6}{7}\frac{4}{5}\frac{2}{3}$
- $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{\pi}{2}\frac{(n)}{(n-1)}\frac{(n-2)}{(n-3)}\frac{(n-4)}{(n-5)}\cdots\cdots\frac{6}{5}\frac{4}{3}\frac{2}{1}$
- $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{(n)}{(n-1)}\frac{(n-2)}{(n-3)}\frac{(n-4)}{(n-5)}\cdots\cdots\frac{6}{5}\frac{4}{3}\frac{2}{1}$

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

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

- $\int_0^{\frac{\pi}{2}} \cos^n x\,dx = \frac{\pi}{2}\frac{(n-1)}{n}\frac{(n-3)}{(n-2)}\frac{(n-5)}{(n-4)}\cdots\cdots\frac{5}{6}\frac{3}{4}\frac{1}{2}$
- $\int_0^{\frac{\pi}{2}} \cos^n x\,dx = \frac{\pi}{2}\frac{(n)}{(n-1)}\frac{(n-2)}{(n-3)}\frac{(n-4)}{(n-5)}\cdots\cdots\frac{6}{5}\frac{4}{3}\frac{2}{1}$
- $\int_0^{\frac{\pi}{2}} \cos^n x\,dx = \frac{(n)}{(n-1)}\frac{(n-2)}{(n-3)}\frac{(n-4)}{(n-5)}\cdots\cdots\frac{6}{5}\frac{4}{3}\frac{2}{1}$
- $\int_0^{\frac{\pi}{2}} \cos^n x\,dx = \frac{(n-1)}{n}\frac{(n-3)}{(n-2)}\frac{(n-5)}{(n-4)}\cdots\cdots\frac{6}{7}\frac{4}{5}\frac{2}{3}$ page183

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

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

- Initial line
- y-axis
- Pole

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

If $a > 0$, then the equation, in polar co-ordinates, of the form $r^2 = a^2 \cos 2\theta$ represent which of the following family of curves?

- Leminscate page 130
- Cardiods
- Rose curves
- Spiral

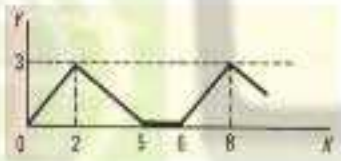
Question No: 15 (Marks: 1) - Please choose one

What is the period of a periodic function defined by $f(x) = \sin \frac{x}{2}$?

- $\frac{\pi}{2}$
- π
- $\frac{3\pi}{2}$
- 4π

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

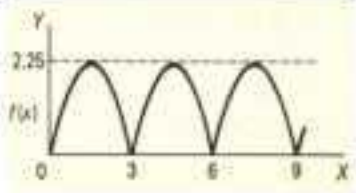
What is the period of periodic function whose graph is as below?



- 2
- 5
- 6
- 8

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

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



- 0
- 2.25
- 3
- 6

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

Let L denotes the Laplace Transform.
If $L\{F(t)\} = f(s)$ where s is a constant, then which of the following equation holds?

- $L\{t\ F(t)\} = -\frac{d}{ds}\{f(s)\}$
- $L\{t\ F(t)\} = f(s+t)$
- $L\{t\ F(t)\} = f(s)$
- $L\{t\,F(t)\} = \int_{s}^{\infty} f(s)\,ds$

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

The graph of an odd function is symmetrical about

- x-axis
- y-axis
- origin

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

Consider the function $f(x, y, z) = \sqrt{1 - x^2 - y^2 - z^2}$. What is the value of $f\left(0, \frac{1}{2}, \frac{1}{2}\right)$?

- $f\left(0, \frac{1}{2}, \frac{1}{2}\right) = \sqrt{\frac{1}{2}}$
- $f\left(0, \frac{1}{2}, \frac{1}{2}\right) = 2$
- $f\left(0, \frac{1}{2}, \frac{1}{2}\right) = \frac{1}{2}$
- $f\left(0, \frac{1}{2}, \frac{1}{2}\right) = 0$

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

The path of integration of a line integral must be

- straight and single-valued
- continuous and single-valued
- straight and multiple-valued
- continuous and multiple-valued

Question No: 22 (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: 23 (Marks: 1) - Please choose one

Let the functions $P(x, y)$ and $Q(x, y)$ are finite and continuous inside and at the boundary of a closed curve C in the xy-plane.

If $(P\,dx + Q\,dy)$ is an exact differential then

$\oint_C (P\,dx + Q\,dy) =$

- **Zero**
- One
- Infinite

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

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

- $L\{e^{5t}\} = \frac{1}{s-5}$
- $L\{e^{5t}\} = \frac{s}{s^2+25}$
- $L\{e^{5t}\} = \frac{5}{s^2+25}$
- $L\{e^{5t}\} = \frac{5!}{s^6}$

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

What is laplace transform of the function $F(t)$ if $F(t) = \sin 3t$?

- $L\{\sin 3t\} = \frac{3}{s^2+9}$
- $L\{\sin 3t\} = \frac{s}{s^2+9}$

- $L\{\sin 3t\} = \frac{1}{s-3}$
- $L\{\sin 3t\} = \frac{3!}{s^4}$

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

If L denotes laplace transform then

$L\{te^{5t}\} =$

- $L\{te^{5t}\} = \frac{1}{s^2-5}$
- $L\{te^{5t}\} = \frac{1}{s^2+5}$
- $L\{te^{5t}\} = \frac{1}{(s+5)^2}$
- $L\{te^{5t}\} = \frac{1}{(s-5)^2}$

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

Evaluate the line integral $\int_C (3x+2y)\,dx+(2x-y)\,dy$ where C is the line segment from (0, 0) to (0, 2).

- 1
- 0
- 2
- -2

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

Evaluate the line integral $\int_C (2x+y)\,dx+(x^2-y)\,dy$ where C is the line segment from (0, 0) to (0, 2).

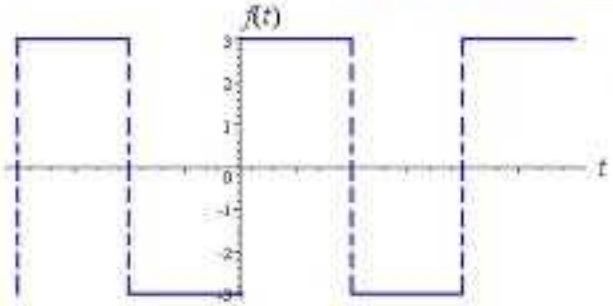
- -4
- -2
- 0
- 2

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

Divergence of a vector function is always a ----------

- Scalar
- Vector

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



Which of the following is true for a function whose graph is given above

- An odd function
- An even function
- Neither even nor odd

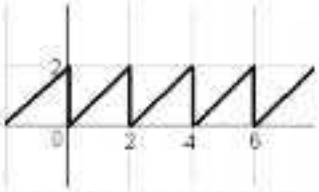
Question No: 31 (Marks: 2)

Does the following limit exist? If yes find its value, if no give reason

$$\lim_{t\to 0}\left[(e^{2t}+5)\hat{i}+(t^2+2t-3)\hat{j}+\left(\frac{1}{t}\right)\hat{k}\right]$$

Question No: 32 (Marks: 2)

Define the periodic function whose graph is shown below.



Question No: 33 (Marks: 2)

Find Laplace Transform of the function $F(t)$ if $F(t)=t^4$

Solution:

The Laplace transform of the given function will be:

$f(t)=t^4$

$L\{t^4\}=\frac{4!}{s^5}$

Question No: 34 (Marks: 3)

Determine whether the following differential is exact or not.

$dz=(4x^3y+2xy^3)\,dx+(x^4+3x^2y^2)\,dy$

Question No: 35 (Marks: 3)

Use Wallis sine formula to evaluate $\int_0^{\frac{\pi}{2}} (\sin^3 x + \sin^5 x)\,dx$

Solution:

$$\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{7}{8}.\frac{5}{6}.\frac{3}{4}.\frac{1}{2}\text{-----}\frac{\pi}{2}$$

Question No: 36 (Marks: 3)

Find Laplace transform of the function $F(t)$ if

$F(t) = e^{2t} \sin 3t$

Solution:

Laplace transform will be

$L(t) = e^{2t}$.....1

$= \frac{1}{s-2}$

$L(t) = \sin 3t$.....2

$L(t) = \frac{a}{s^2+3^2}$

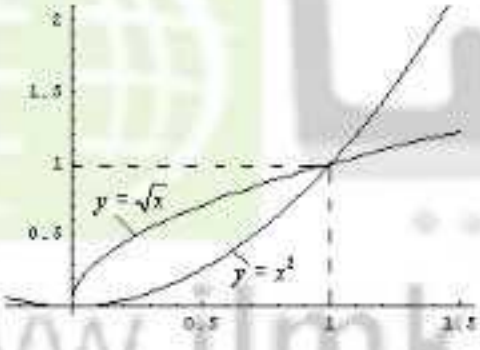
$L(t) = \frac{a}{s^2+9}$

Combining,

$L(t) = (\frac{1}{s-2})(\frac{a}{s^2+9})$

Question No: 37 (Marks: 5)

Using definite integral, find area of the region that is enclosed between the curves $y = x^2$ *and* $y = \sqrt{x}$



Question No: 38 (Marks: 5)

Determine the fourier co-efficient b_n of the following function.

$f(x) = x^2 \qquad 0 < x < 2\pi$

Question No: 39 (Marks: 5)

Determine whether the following vector field $\vec{F}$ is conservative or not.

$\vec{F}(x, y, z) = (4x - z)\,i + (3y + z)\,j + (y - x)\,k$