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

There is one-to-one correspondence between the set of points on co-ordinate line and ----------

- ► Set of real numbers
- ► Set of integers
- ► Set of natural numbers
- ► Set of rational 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

$\lim_{(x,y)\to(0,0)} \frac{xy^2}{x^2+y^2} =$

- ► ∞
- ► 0
- ► 1
- ► 0.5

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

If $f(x, y) = x^2y - y^3 + \ln x$

then $\frac{\partial^2 f}{\partial x^2} =$

- $2xy+\frac{1}{x^2}$
- $2y+\frac{1}{x^2}$
- $2xy-\frac{1}{x^2}$
- $2y-\frac{1}{x^2}$

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

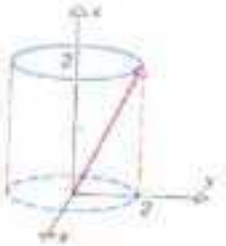
Suppose $f(x, y)=xy-2y^2$ *where* $x=3t+1$ *and* $y=2t$. Which one of the following is true?

- $\frac{df}{dt}=-4t+2$
- $\frac{df}{dt}=-16t-t$
- $\frac{df}{dt}=18t+2$
- $\frac{df}{dt}=-10t^2+8t+1$

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 $0\le t\le 2\pi$



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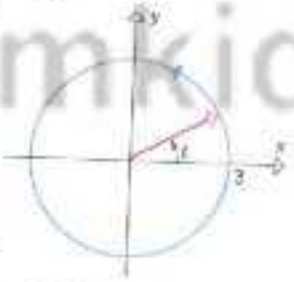

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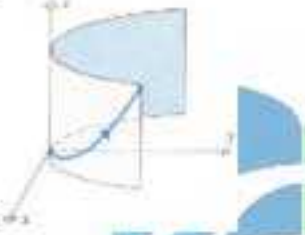

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Question No: 7 (Marks: 1) - Please choose one

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: 8 (Marks: 1) - Please choose one

Is the following vector-valued function $\vec{r}(t)$ continuous at $t=\frac{\pi}{2}$? If not, why?

$\vec{r}(t)=(\tan t, \sin t^2, \cos t)$

- $\vec{r}(t)$ is continuous at $t=\frac{\pi}{2}$
- $\vec{r}\left(\frac{\pi}{2}\right)$ is not defined
- $\vec{r}\left(\frac{\pi}{2}\right)$ is defined but $\lim_{t\to\frac{\pi}{2}} \vec{r}(t)$ does not exist
- $\vec{r}\left(\frac{\pi}{2}\right)$ is defined and $\lim_{t\to\frac{\pi}{2}} \vec{r}(t)$ exists but these two numbers are not equal. Not sure

Question No: 9 (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: 10 (Marks: 1) - Please choose one

The following differential is exact

$dz=(6xy+2y^2-5)\,dx+(3x^2+4xy-6)\,dy$

□□□□□□□ ▶ True
□□□□□□□ ▶ False

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

The following differential is exact

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

□□□□□□□ ▶ True
□□□□□□□ ▶ False

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

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

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

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

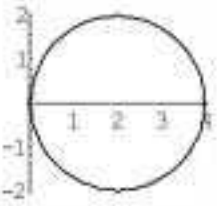
□□□□□□□ ▶ $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{\pi}{2}\frac{(n)}{(n-1)}\frac{(n-2)}{(n-3)}\frac{(n-4)}{(n-5)} \cdots \frac{6}{5}\frac{4}{3}\frac{2}{1}$

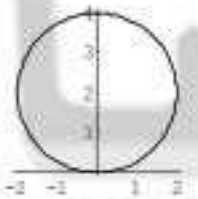
□□□□□□□ ▶ $\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \frac{(n)}{(n-1)}\frac{(n-2)}{(n-3)}\frac{(n-4)}{(n-5)} \cdots \frac{6}{5}\frac{4}{3}\frac{2}{1}$

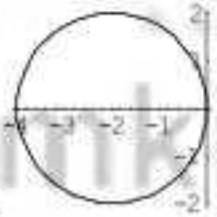
Question No: 13 (Marks: 1) - Please choose one

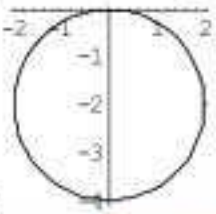
Match the following equation in polar co-ordinates with its graph.

$r = 4\sin\theta$

□□□□□□□ ▶ 



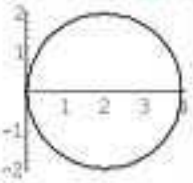


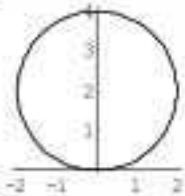


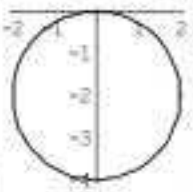
Question No: 14 (Marks: 1) - Please choose one

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

$r = -4\sin\theta$



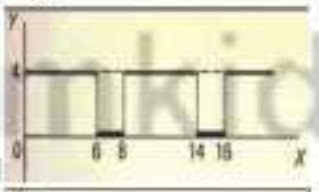




Question No: 15 (Marks: 1) - Please choose one

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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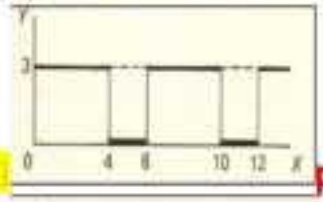

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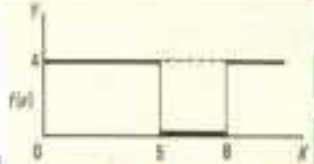

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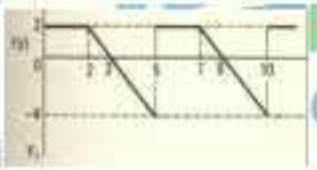

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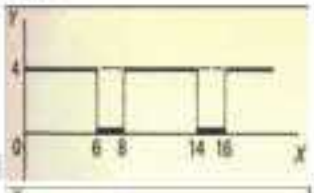
Question No: 16 (Marks: 1) - Please choose one

Match the following periodic function with its graph.

$$f(x)=\begin{cases}4 & 0<x<5\\ 0 & 5<x<8\end{cases}$$



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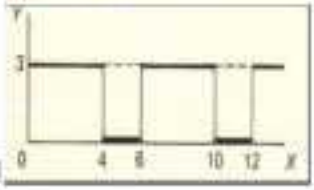

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Question No: 17 (Marks: 1) - Please choose one

Which of the following condition must be satisfied for a vector field $\vec{F}$ to be a conservative vector field?

► Line integral of $\vec{F}$ along a curve, depends only on the endpoints of that curve, not on the particular route taken.

► Divergence of $\vec{F}$ should be zero

► Gradient of $\vec{F}$ should be zero

► $\vec{F} = 0$

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

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

► π

► $-\pi$

► 2π

► -2π

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

Let L denotes the Laplace Transform.

According to First Shift Theorem, if $L\{F(t)\} = f(s)$ then which of the following equation holds?

s and a are constants.

- $L\{e^{-at}F(t)\} = f(s-a)$
- $L\{e^{-at}F(t)\} = f(s+a)$
- $L\{e^{-at}F(t)\} = f(s)$
- $L\{e^{-at}F(t)\} = f(a)$

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

Polar co-ordinates of a point are $\left(7, \frac{-\pi}{4}\right)$. Which of the following is another possible polar co-ordinates representation of this point?

- $\left(7, \frac{3\pi}{4}\right)$
- $\left(-7, \frac{3\pi}{4}\right)$
- $\left(-7, \frac{-\pi}{4}\right)$
- $\left(7, \frac{-3\pi}{4}\right)$

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

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

- x-axis
- y-axis
- origin

Question No: 22 (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 $\lim_{(x,y)\to(0,0)} f(x, y)$ exists but these two numbers are not equal.

Question No: 23 (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: 24 (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: 25 (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: 26 (Marks: 1) - Please choose one

What is laplace transform of the function $F(t)$ if $F(t)=\cos 2t$?

- $L\{\cos 2t\}=\frac{2}{s^2+4}$
- $L\{\cos 2t\}=\frac{1}{s-2}$
- $L\{\cos 2t\}=\frac{s}{s^2+4}$
- $L\{\cos 2t\}=\frac{2!}{s^3}$

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

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

- $L\{-6\}=\frac{1}{s+6}$
- $L\{-6\}=\frac{-6}{s}$
- $L\{-6\}=\frac{s}{s^2+36}$
- $L\{-6\}=\frac{-6}{s^2+36}$

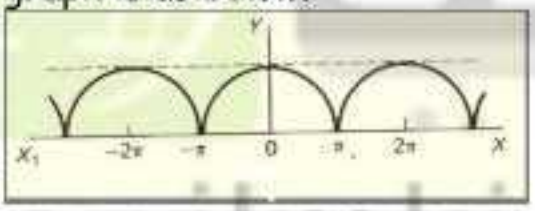
Question No: 28 (Marks: 1) - Please choose one

Curl of vector function is always a ----------

- Scalar
- Vector

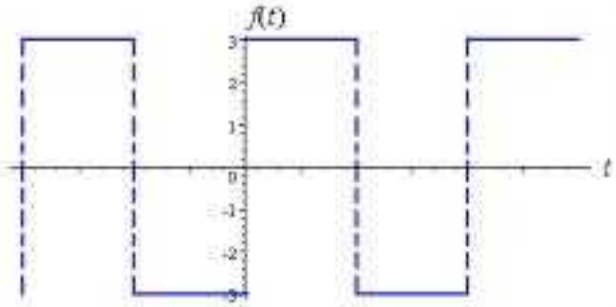
Question No: 29 (Marks: 1) - Please choose one

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: 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)

Evaluate the line integral $\int_C 2x\,dx$ where C is the line segment from $(0, 2)$ to $(2, 6)$

Question No: 32 (Marks: 2)

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

Question No: 33 (Marks: 2)

Find Laplace Transform of the function $F(t)$ if $F(t) = \sin 2t$.

Question No: 34 (Marks: 3)

Find $div\ \vec{F}$, if $\vec{F} = (3x + y)i + xy^2z\,j + (xz^2)k$

Question No: 35 (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: 36 (Marks: 3)

Prove whether the following function is even, odd or neither.

$f(x) = x^3e^x$

Question No: 37 (Marks: 5)

Evaluate the following line integral which is independent of path.

$$\int_{(2,-2)}^{(-1,0)} (2xy^3)\,dx + (3y^2x^2)\,dy$$

Question No: 38 (Marks: 5)