



Virtual University

About Us

MTH301
Solved Final Term Paper 3

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Year
2017

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

In the Name of Allāh, the Most Gracious, the Most Merciful

Paper Pattern

MCQS 40 each 1 mark
Short 4 each 2 marks
Short 4 each 3 marks
long 4 each 5 marks

Question No : 1 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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

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

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

correct

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

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Question No : 2 of 52

Marks: 1 (Budgeted Time 1 Min)

What is the amplitude of a periodic function defined by $f(x) = 4 \sin 2x$?

Answer (Please select your correct option)

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☐ 2

☐ 4

correct

☐ 8

☐ 16

Made by: Waqar Siddhu

Question No : 3 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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

correct

Made by: Waqar Siddhu

Question No : 4 of 52

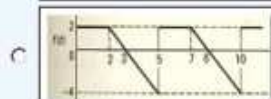
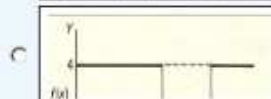
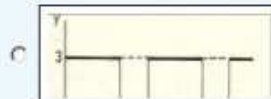
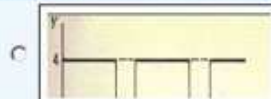
Marks: 1 (Budgeted Time 1 Min)

Match the following periodic function with its graph.

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

Answer (Please select your correct option)

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Question No : 4 of 52

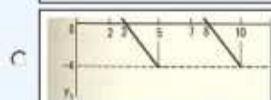
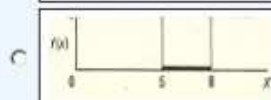
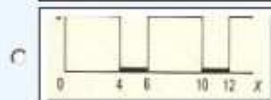
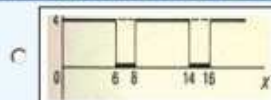
Marks: 1 (Budgeted Time 1 Min)

Match the following periodic function with its graph.

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

Answer (Please select your correct option)

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correct

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Question No : 5 of 52

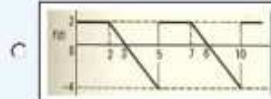
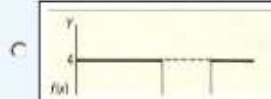
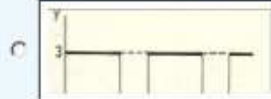
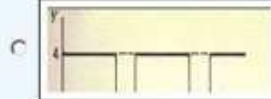
Marks: 1 (Budgeted Time 1 Min)

Match the following periodic function with its graph.

$$f(x) = \begin{cases} 4 & 0 < x < 6 \\ 0 & 6 < x < 8 \end{cases}$$

Answer (Please select your correct option)

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Question No : 5 of 52

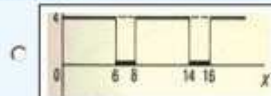
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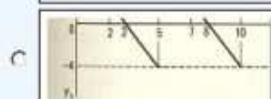
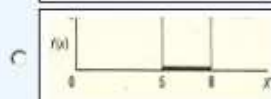
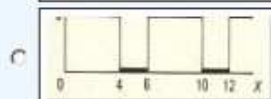
$$f(x) = \begin{cases} 4 & 0 < x < 6 \\ 0 & 6 < x < 8 \end{cases}$$

Answer (Please select your correct option)

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correct

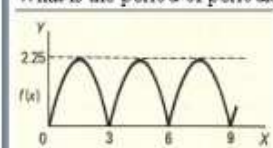


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Question No : 6 of 52

Marks: 1 (Budgeted Time 1 Min)

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



Answer (Please select your correct option)

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☐ 0

☐ 2.25

☐ 3

correct

☐ 6

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Question No : 7 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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- ☐ 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.
- ☐ $\vec{F} = 0$

correct

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Question No : 8 of 52

Marks: 1 (Budgeted Time 1 Min)

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.

Answer (Please select your correct option)

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

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Question No : 9 of 52

Marks: 1 (Budgeted Time 1 Min)

The function $f(x) = x^2 \cos 2x$ is -----

Answer (Please select your correct option)

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- ☐ Even function
- ☐ Odd function
- ☐ Neither even nor odd

correct

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Question No : 10 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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☐ $3te^{2t} - 2$

☐ $3e^{2t} - 2t$

☐ $3e^{2t} - 2$

correct

☐ None of these.

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Question No : 11 of 52

Marks: 1 (Budgeted Time 1 Min)

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

(s is a constant)

Answer (Please select your correct option)

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☐ $\int_0^s e^{-st} F(t) dt$

☐ $\int_0^\infty e^{st} F(t) dt$

☐ $\int_{-\infty}^\infty e^{-st} F(t) dt$

☐ $\int_0^\infty e^{-st} F(t) dt$

correct

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Question No : 12 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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☐ $L(\sin 3t) = \frac{3}{s^2 + 9}$

correct

☐ $L(\sin 3t) = \frac{s}{s^2 + 9}$

☐ $L(\sin 3t) = \frac{1}{s-3}$

☐ $L(\sin 3t) = \frac{3!}{s^4}$

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Question No : 13 of 52

Marks: 1 (Budgeted Time 1 Min)

If \mathcal{L} denotes laplace transform then
 $\mathcal{L}(te^{5t}) =$

Answer (Please select your correct option)

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

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

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

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

correct

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Question No : 14 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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☐ $\mathcal{L}^{-1}\left\{\frac{s}{s^2 + 25}\right\} = \sin 5t$

☐ $\mathcal{L}^{-1}\left\{\frac{s}{s^2 + 25}\right\} = \cos 5t$

correct

☐ $\mathcal{L}^{-1}\left\{\frac{s}{s^2 + 25}\right\} = \sin 25t$

☐ $\mathcal{L}^{-1}\left\{\frac{s}{s^2 + 25}\right\} = \cos 25t$

Made by: Waqar Siddhu

Question No : 15 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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☐ $\mathcal{L}(-6) = \frac{1}{s+6}$

☐ $\mathcal{L}(-6) = \frac{-6}{s}$

correct

☐ $\mathcal{L}(-6) = \frac{s}{s^2 + 36}$

☐ $\mathcal{L}(-6) = \frac{-6}{s^2 + 36}$

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Question No : 16 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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Scalar

☐

Vector

☐

correct

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Question No : 17 of 52

Marks: 1 (Budgeted Time 1 Min)

Which of the following is geometrical representation of set of real numbers?

Answer (Please select your correct option)

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Co-ordinate line

☐

correct

xy-plane

☐

Sphere

☐

Circular cylinder

☐

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Question No : 18 of 52

Marks: 1 (Budgeted Time 1 Min)

Which of the following is the interval notation of real line?

Answer (Please select your correct option)

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$(-\infty, +\infty)$

☐

correct

$(-\infty, 0)$

☐

$(0, +\infty)$

☐

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Question No : 19 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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☐

A unique point

correct

☐

A point in each octant

☐

Three points

☐

Infinite number of points

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Question No : 20 of 52

Marks: 1 (Budgeted Time 1 Min)

What is the distance between points (3, 2, 0) and (1, 0, -1)?

Answer (Please select your correct option)

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☐

3

correct

☐ $\sqrt{6}$ ☐ $\sqrt{3}$ ☐ $\sqrt{10}$

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Question No : 21 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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☐

3, 2, 9

☐

1, -4, -1

☐

2, -3, 20

☐0.5, -3, $\frac{5}{4}$

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Question No : 22 of 52

Marks: 1 (Budgeted Time 1 Min)

In three dimensional space, the equation $y = x^2$ always represents

Answer (Please select your correct option)

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☐ Parabola

correct

☐ Straight line☐ Half cylinder☐ Cone

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Question No : 23 of 52

Marks: 1 (Budgeted Time 1 Min)

For a function $f(x, y, z)$, the equation $\frac{\partial^2 f}{\partial^2 x} + \frac{\partial^2 f}{\partial^2 y} + \frac{\partial^2 f}{\partial^2 z} = 0$ is known as

Answer (Please select your correct option)

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☐ Gauss Equation☐ Euler's equation☐ Laplace's Equation

correct

☐ Stoke's Equation

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Question No : 24 of 52

Marks: 1 (Budgeted Time 1 Min)

Every differentiable function is always

Answer (Please select your correct option)

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☐ Piece wise continuous☐ Discontinuous☐ Continuous

correct

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Question No : 25 of 52

Marks: 1 (Budgeted Time 1 Min)

Gradient of a scalar function always results in a function.

Answer (Please select your correct option)

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☐ Scalar

☐ Continuous

☒ Vector

correct

☐ Constant

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Question No : 26 of 52

Marks: 1 (Budgeted Time 1 Min)

The two normal lines for the surfaces $f(x, y, z) = 0$ and $g(x, y, z) = 0$, are orthogonal if and only if where f_x, f_y, f_z and g_x, g_y, g_z are direction ratios for the two normal lines respectively.

Answer (Please select your correct option)

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☐ $f_x g_y + f_y g_z + f_z g_x = 0$
☐ $f_x g_x + f_y g_y + f_z g_z \geq 0$
☒ $f_x g_x + f_y g_y + f_z g_z = 0$

correct

☐ $f_x + f_y + f_z + g_x + g_y + g_z = 0$

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Question No : 27 of 52

Marks: 1 (Budgeted Time 1 Min)

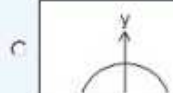
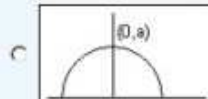
Match the following equation in polar co-ordinates with its graph.

 $r \cos \theta = a$

where a is an arbitrary constant

Answer (Please select your correct option)

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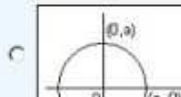
Question No : 28 of 52

Marks: 1 (Budgeted Time 1 Min)

Match the following equation in polar co-ordinates with its graph.
 $r \sin \theta = a$
 where a is an arbitrary constant

Answer (Please select your correct option)

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correct



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Question No : 29 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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☐ $\left(2, \frac{-\pi}{4}\right)$

☐ $\left(2, \frac{-\pi}{2}\right)$

correct

☐ $\left(2, \frac{-\pi}{3}\right)$

☐ $\left(2, \frac{3\pi}{4}\right)$

Made by: Waqar Siddhu

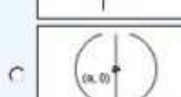
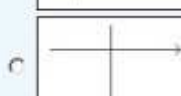
Question No : 28 of 52

Marks: 1 (Budgeted Time 1 Min)

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 $r \sin \theta = a$
 where a is an arbitrary constant

Answer (Please select your correct option)

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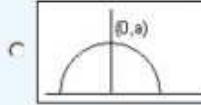
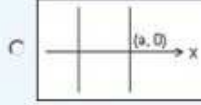
Question No : 27 of 52

Marks: 1 (Budgeted Time 1 Min)

Match the following equation in polar co-ordinates with its graph.
 $r \cos \theta = a$
 where a is an arbitrary constant

Answer (Please select your correct option)

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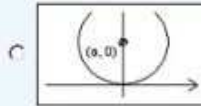
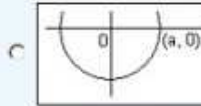
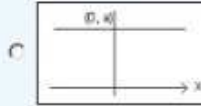
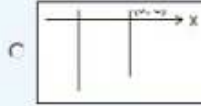
Question No : 27 of 52

Marks: 1 (Budgeted Time 1 Min)

Match the following equation in polar co-ordinates with its graph.
 $r \cos \theta = a$
 where a is an arbitrary constant

Answer (Please select your correct option)

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Made by: Waqar Siddhu

Question No : 29 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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☐ $\left(2, \frac{-\pi}{4}\right)$

☐ $\left(2, \frac{-\pi}{2}\right)$

☐ $\left(2, \frac{-\pi}{3}\right)$

☐ $\left(2, \frac{3\pi}{4}\right)$

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Question No : 30 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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Initial line

☐

correct

y-axis

☐

Pole

☐

origin

☐

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Question No : 31 of 52

Marks: 1 (Budgeted Time 1 Min)

Given the integral $\iint_R f(x,y) dx dy$, after converting to polar coordinates, it will become where $a \leq \theta \leq b$ and $c \leq r \leq d$.

Answer (Please select your correct option)

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☐ $\int_a^b \int_c^d f(r, \theta) r dr d\theta$
☐ $\int_a^b \int_c^d f(r, \theta) dr d\theta$

correct

☐ $\int_a^b \int_c^d f(r, \theta) r d\theta dr$
☐ $\int_a^b \int_c^d f(r, \theta) d\theta dr$

Made by: Waqar Siddhu

Question No : 32 of 52

Marks: 1 (Budgeted Time 1 Min)

The parametric equations that correspond to the vector equation $\vec{r}(t) = \sin^2 t \hat{i} + (1 - \cos 2t) \hat{j}$ are

Answer (Please select your correct option)

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

correct

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

Made by: Waqar Siddhu

Question No : 33 of 52

Marks: 1 (Budgeted Time 1 Min)

The graph of the equation $r = 3\hat{i} - 2\hat{j} - \hat{k}$ is the point

Answer (Please select your correct option)

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☐ (1, -2, 3)

☐ (3, -2, -1)

correct

☐ (3, 2, 1)

☐ (-3, -2, -1)

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Question No : 34 of 52

Marks: 1 (Budgeted Time 1 Min)

If $\hat{R}(t)$ is the anti-derivative of a given vector valued function $\hat{r}(t)$ i.e., $\hat{R}'(t) = \hat{r}(t)$ then $\int_a^b \hat{r}(t) dt = \dots\dots\dots$

Answer (Please select your correct option)

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☐ $\hat{R}(a) + \hat{R}(b)$
☐ $\hat{R}(b) - \hat{R}(a) + c$ where c is a non-zero constant

correct

☐ $\hat{R}(a) \cdot \hat{R}(b)$
☐ $\hat{R}(b) - \hat{R}(a)$

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Question No : 35 of 52

Marks: 1 (Budgeted Time 1 Min)

For the given vector valued functions $\hat{r}_1(t)$ and $\hat{r}_2(t)$, $\frac{d}{dt}[\hat{r}_1(t) \times \hat{r}_2(t)] = \dots\dots\dots$ where " \times " and " \cdot " represent the cross and dot product respectively.

Answer (Please select your correct option)

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☐ $\hat{r}_1 \cdot \frac{d\hat{r}_2}{dt} + \frac{d\hat{r}_1}{dt} \cdot \hat{r}_2$
☐ $\hat{r}_1 \times \frac{d\hat{r}_2}{dt} + \frac{d\hat{r}_1}{dt} \times \hat{r}_2$
☐ $\frac{d\hat{r}_2}{dt} \times \hat{r}_1 + \hat{r}_2 \times \frac{d\hat{r}_1}{dt}$
☐ $\frac{d\hat{r}_2}{dt} \times \hat{r}_1 + \frac{d\hat{r}_1}{dt} \times \hat{r}_2$

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Question No : 36 of 52

Marks: 1 (Budgeted Time 1 Min)

A vector valued function $\vec{r}(t) = x(t)\hat{i} + y(t)\hat{j} + z(t)\hat{k}$ is continuous if

Answer (Please select your correct option)

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☐

Atleast one of its components is continuous.

☐

All of its components are necessarily differentiable.

correct

☐

All of its components are continuous.

☐

Limit exists for all of its components.

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Question No : 37 of 52

Marks: 1 (Budgeted Time 1 Min)

Given a vector valued function $\vec{r}(t) = \frac{1}{(t-3)}\hat{i} + e^t\hat{j}$ and its anti-derivative $\vec{R}(t) = \ln(t-3)\hat{i} + e^t\hat{j}$, then $\int \vec{r}(t) dt = \dots\dots\dots$

Answer (Please select your correct option)

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☐ $\ln(t-3)\hat{i} + e^t\hat{j} + c$

correct

☐ $(t-3)\hat{i} + \frac{e^t}{2}\hat{j} + c$ ☐ $(t-3)^{-1}\hat{i} + \frac{e^t}{2}\hat{j} + c$ ☐ $\frac{1}{(t-3)}\hat{i} + e^t\hat{j}$

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Question No : 38 of 52

Marks: 1 (Budgeted Time 1 Min)

For any two vector valued functions $\vec{r}_1(t)$ and $\vec{r}_2(t)$, $\frac{d}{dt}[\vec{r}_1(t) \times \vec{r}_2(t)] = \dots\dots\dots$ where " \times " and " \cdot " represent the cross and dot product respectively.

Answer (Please select your correct option)

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☐ $\vec{r}_1 \cdot \frac{d\vec{r}_2}{dt} - \frac{d\vec{r}_1}{dt} \cdot \vec{r}_2$ ☐ $\vec{r}_1 \cdot \frac{d\vec{r}_2}{dt} + \frac{d\vec{r}_1}{dt} \cdot \vec{r}_2$ ☐ $\vec{r}_1 \times \frac{d\vec{r}_2}{dt} + \frac{d\vec{r}_1}{dt} \times \vec{r}_2$ ☐ $\vec{r}_1 \cdot \frac{d\vec{r}_2}{dt} - \frac{d\vec{r}_1}{dt} \times \vec{r}_2$

correct

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Question No : 39 of 52

Marks: 1 (Budgeted Time 1 Min)

A single curve can be represented by vector valued function(s).

Answer (Please select your correct option)

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☐

Two

☐

Infinitely many

☐

Single

correct

☐

Three

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Question No : 40 of 52

Marks: 1 (Budgeted Time 1 Min)

A function is said to be smooth if it's derivative is on any value of its domain.

Answer (Please select your correct option)

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☐

continuous and non zero

☐

piecewise continuous

☐

defined and non zero

☐

differentiable

correct

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Question No : 41 of 52

Marks: 2 (Budgeted Time 4 Min)

Use Wallis cosine formula to evaluate $\int_0^{\frac{\pi}{2}} \cos^6 x \, dx$

Answer (Please click here to Add Answer)

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Question No : 42 of 52

Marks: 2 (Budgeted Time 4 Min)

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

$$f(x) = x^3 + x^2$$

Answer ([Please click here to Add Answer](#))

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Question No : 43 of 52

Marks: 2 (Budgeted Time 4 Min)

Let $f(x, y) = \tan^{-1} \frac{y}{x} - y^2 \tan^{-1} \frac{x}{y}$. Is the function defined at (1, 1)? If yes, what is its value and if no, give the reason.

Answer ([Please click here to Add Answer](#))

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Question No : 44 of 52

Marks: 2 (Budgeted Time 4 Min)

Evaluate the following limit.

$$\lim_{t \rightarrow \frac{\pi}{4}} [(\cos t)\hat{i} + (\sin t)\hat{j}]$$

Answer ([Please click here to Add Answer](#))

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Question No : 45 of 52

Marks: 3 (Budgeted Time 6 Min)

Determine the fourier co-efficient a_0 , of periodic function defined by
 $f(x) = x \quad 0 < x < 1$

Answer (Please click here to Add Answer)

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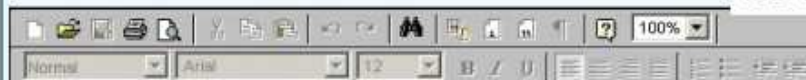
Question No : 46 of 52

Marks: 3 (Budgeted Time 6 Min)

Use Wallis sine formula to evaluate $\int_0^{\frac{\pi}{2}} (\sin^3 x + \sin^4 x) dx$

Answer (Please click here to Add Answer)

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Question No : 47 of 52

Marks: 3 (Budgeted Time 6 Min)

If the order of integration for the integral $\int_0^2 \int_y^4 y \cos x^2 dx dy$ is changed. Find the change in the limits of new integral.

Answer (Please click here to Add Answer)

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Question No : 48 of 52

Marks: 3 (Budgeted Time 6 Min)

What is the arc-length of the curve $\vec{r}(t) = 3\cos t \hat{i} + 3\sin t \hat{j}$ when $0 \leq t \leq 2\pi$?

Answer (Please click here to Add Answer)

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Question No : 49 of 52

Marks: 5 (Budgeted Time 10 Min)

Consider a periodic function defined by
 $f(x) = 3x \quad -\pi \leq x \leq \pi$

- (i) Find whether the given function is even or odd?
- (ii) Determine Fourier Co-efficients a_0 , a_n and b_n

Answer (Please click here to Add Answer)

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Question No : 50 of 52

Marks: 5 (Budgeted Time 10 Min)

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

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

Answer (Please click here to Add Answer)

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Question No : 51 of 52

Marks: 5 (Budgeted Time 10 Min)

Find Equation of a Tangent plane to the surface $f(x, y, z) = x^2 + 3y + z^3 - 9$ at the point $(2, -1, 2)$

Answer ([Please click here to Add Answer](#))

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Question No : 52 of 52

Marks: 5 (Budgeted Time 10 Min)

Let $\vec{r}(t) = t^2 \hat{i} + t \hat{j} + (t^2 - 5) \hat{k}$. Find t, such that $\vec{r}(t)$ and $\vec{r}'(t)$ are perpendicular to each other.

Answer ([Please click here to Add Answer](#))

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