



Virtual University

About Us

MTH301  
Solved Final Term Paper 4

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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 Cosine formula when  $n$  is odd and  $n \geq 3$ ?

Answer ( Please select your correct option )

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

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

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

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

correct Made by: Waqar Siddhu

Question No : 2 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer ( Please select your correct option )

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☐ 1

☐ 3

☐ 4

correct

☐ 12

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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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☐  $\frac{\pi}{2}$ 
☐  $\pi$ 

correct

☐  $\frac{3\pi}{2}$ 
☐  $4\pi$ 

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Question No : 4 of 52

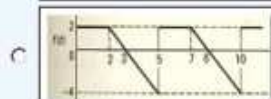
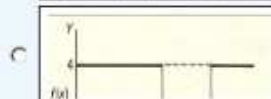
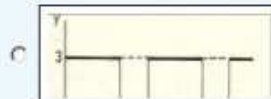
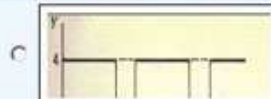
Marks: 1 (Budgeted Time 1 Min)

Match the following periodic function with its graph.

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

Answer ( Please select your correct option )

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Question No : 4 of 52

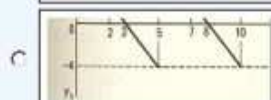
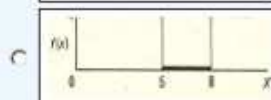
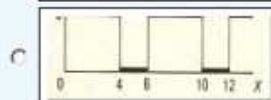
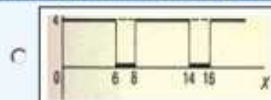
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Question No : 5 of 52

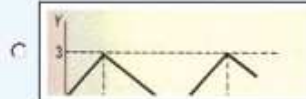
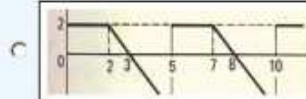
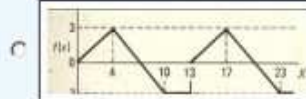
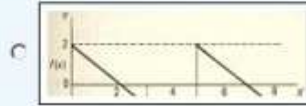
Marks: 1 (Budgeted Time 1 Min)

Match the following periodic function with its graph.

$$f(x) = \begin{cases} 2-x & 0 < x < 3 \\ -1 & 3 < x < 5 \end{cases}$$

Answer ( Please select your correct option )

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Question No : 5 of 52

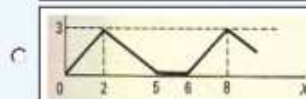
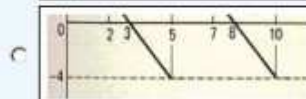
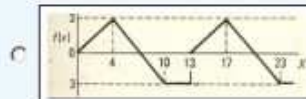
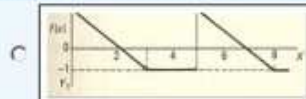
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Question No : 6 of 52

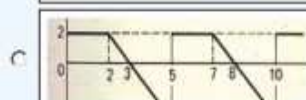
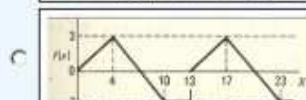
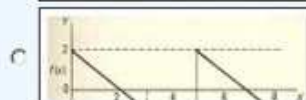
Marks: 1 (Budgeted Time 1 Min)

Match the following periodic function with its graph.

$$f(x) = \begin{cases} \frac{3}{4}x & 0 < x < 4 \\ 7-x & 4 < x < 10 \\ -3 & 10 < x < 13 \end{cases}$$

Answer ( Please select your correct option )

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correct

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Question No : 6 of 52

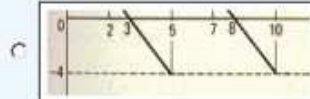
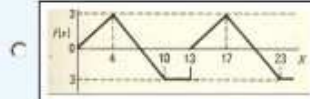
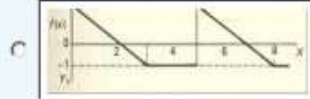
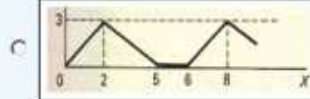
Marks: 1 (Budgeted Time 1 Min)

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Answer ( Please select your correct option )

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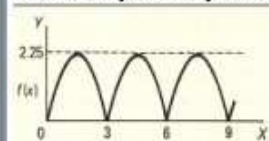


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Question No : 7 of 52

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 : 8 of 52

Marks: 1 (Budgeted Time 1 Min)

The function  $f(x) = x^3 e^x$  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 : 9 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer ( Please select your correct option )

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☐ x-axis☐☐ y-axis☐

correct

☐ origin☐

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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  $f(s) = \frac{3}{s-2} - \frac{2}{s}$ ?

Answer ( Please select your correct option )

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☐  $3te^{2t} - 2$ ☐☐  $3e^{2t} - 2t$ ☐☐  $3e^{2t} - 2$ ☐

correct

☐ None of these.☐

Made by: Waqar Siddhu

Question No : 11 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer ( Please select your correct option )

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☐  $L(e^{5t}) = \frac{1}{s-5}$ ☐

correct

☐  $L(e^{5t}) = \frac{s}{s^2+25}$ ☐☐  $L(e^{5t}) = \frac{5}{s^2+25}$ ☐☐  $L(e^{5t}) = \frac{5!}{s^6}$ ☐

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

Answer ( Please select your correct option )

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☐

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

☐

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

☐

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

☐

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

correct

Made by: Waqar Siddhu

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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☐

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

☐

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

☐

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

☐

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

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Question No : 15 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer ( Please select your correct option )

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Scalar

☐

correct

Vector

☐

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Question No : 16 of 52

Marks: 1 (Budgeted Time 1 Min)

If  $p$  is the period of a function then that function is said to be periodic if  $f(x+p) = f(x)$  . -----

Answer ( Please select your correct option )

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For all values of  $x$  in the domain of  $f$

☐

correct

For positive values of  $x$  in the domain of  $f$

☐

For negative values of  $x$  in the domain of  $f$

☐

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Question No : 17 of 52

Marks: 1 (Budgeted Time 1 Min)

Which of the following is associated to each point on a plane?

Answer ( Please select your correct option )

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A real number

☐

correct

A natural number

☐

An ordered pair

☐

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Question No : 18 of 52

Marks: 1 (Budgeted Time 1 Min)

Consider the interval  $(-1, 5)$  on co-ordinate line. What does this interval denote?

Answer ( Please select your correct option )

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☐

The set of all real numbers between -1 and 5

correct

☐

The set of all integers between -1 and 5

☐

The set of all natural numbers between -1 and 5

☐

The set of all rational numbers between -1 and 5

Made by: Waqar Siddhu

Question No : 19 of 52

Marks: 1 (Budgeted Time 1 Min)

Equation of the circular disk with radius  $a$  and origin at  $(0, 0)$  is given by .....

Answer ( Please select your correct option )

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☐ $x^2 + y^2 = a^2$ 

correct

☐ $x^2 + y^2 \geq a^2$ ☐ $x^2 + y^2 \leq a^2$ 

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Question No : 20 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 : 21 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer ( Please select your correct option )

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☐ Entire 3D-Space

correct

☐ Entire 3D-Space except origin☐ First octant of 3D-Space

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Question No : 22 of 52

Marks: 1 (Budgeted Time 1 Min)

Suppose  $f(x, y) = x^3 e^{xy}$ . Which of the following options is correct?

Answer ( Please select your correct option )

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☐  $\frac{\partial f}{\partial y} = 3x^3 e^{xy}$ ☐  $\frac{\partial f}{\partial y} = x^3 e^{xy}$ ☐  $\frac{\partial f}{\partial y} = x^4 e^{xy}$ ☐  $\frac{\partial f}{\partial y} = x^3 y e^{xy}$ 

correct

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Question No : 23 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 : 24 of 52

Marks: 1 (Budgeted Time 1 Min)

Let  $x, y, z$  be the length, width and height of a rectangular box. The area of bottom will be .....

Answer ( Please select your correct option )

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C

$$A = yz$$

C

$$A = xz$$

C

$$A = xy$$

correct

C

$$A = xyz$$

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Question No : 25 of 52

Marks: 1 (Budgeted Time 1 Min)

Let  $x, y, z$  be the length, width and height of an open rectangular box. The surface area of the box will be .....

Answer ( Please select your correct option )

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C

$$A = xy + 2yz + 2xz$$

C

$$A = yz + 4$$

C

$$A = xz + yz + zx$$

C

$$A = xyz$$

correct

Made by: Waqar Siddhu

Question No : 26 of 52

Marks: 1 (Budgeted Time 1 Min)

If  $R = \{(x, y) : 0 \leq x \leq 2 \text{ and } 0 \leq y \leq 3\}$ , then  $\iint_R (1 - ye^{xy}) dA = \dots\dots\dots$

Answer ( Please select your correct option )

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C

$$\int_0^2 \int_0^3 (1 - ye^{xy}) dy dx$$

correct

C

$$\int_0^2 \int_0^3 (1 - ye^{xy}) dx dy$$

C

$$\int_2^3 \int_0^0 (1 - ye^{xy}) dx dy$$

C

$$\int_0^2 \int_0^3 (4xe^{2y}) dy dx$$

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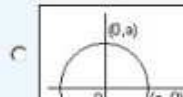
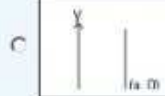
Question No : 27 of 52

Marks: 1 (Budgeted Time 1 Min)

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

Answer ( Please select your correct option )

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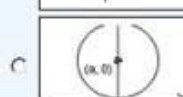
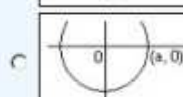
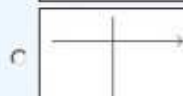
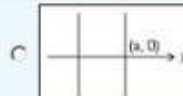
Question No : 27 of 52

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 where  $a$  is an arbitrary constant

Answer ( Please select your correct option )

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correct

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Question No : 28 of 52

Marks: 1 (Budgeted Time 1 Min)

Polar co-ordinates of a point are  $(-8, 45^\circ)$ . Which of the following is another possible polar co-ordinates representation of this point?

Answer ( Please select your correct option )

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☐  $(8, 225^\circ)$

☐  $(-8, 225^\circ)$

☐  $(8, 45^\circ)$

☐  $(8, 315^\circ)$

correct

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Question No : 29 of 52

Marks: 1 (Budgeted Time 1 Min)

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?

Answer ( Please select your correct option )

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☐  $\left(7, \frac{3\pi}{4}\right)$

☐  $\left(-7, \frac{3\pi}{4}\right)$

☐  $\left(-7, \frac{-\pi}{4}\right)$

☐  $\left(7, \frac{-3\pi}{4}\right)$

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Question No : 30 of 52

Marks: 1 (Budgeted Time 1 Min)

If  $p(r, \theta)$  is a point in polar coordinate system, then  $r$  is the distance of  $p$  from .....

Answer ( Please select your correct option )

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☐ Pole

correct

☐ Imaginary axis

☐ None of these

☐ Polar axis

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

correct

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

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

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

Made by: Waqar Siddhu



Question No : 32 of 52

Marks: 1 (Budgeted Time 1 Min)

The 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 : 33 of 52

Marks: 1 (Budgeted Time 1 Min)

The natural domain of a vector valued function is the ..... of the natural domains of its components

Answer ( Please select your correct option )

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☐ Product

☐ Summation

☐ Union

correct

☐ Intersection

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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

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

Made by: Waqar Siddhu



Question No : 35 of 52

Marks: 1 (Budgeted Time 1 Min)

For the given 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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☐  $\vec{r}_1 \cdot \frac{d\vec{r}_2}{dt} + \frac{d\vec{r}_1}{dt} \cdot \vec{r}_2$

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

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

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

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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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☐  $\ln(t-3)\hat{i} + e^t\hat{j} + c$

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

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

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

correct

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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  $\vec{r}_2(t)$ ,  $\frac{d}{dt}[\vec{r}_1(t) \times \vec{r}_2(t)] = \dots$  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

☐ Three

correct

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

Answer ( Please click here to Add Answer )

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Question No : 42 of 52

Marks: 2 (Budgeted Time 4 Min)

Find Laplace transform of the function  $f(t)$  if  $F(t) = \cos 3t$ .

Answer ( Please click here to Add Answer )

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Question No : 43 of 52

Marks: 2 (Budgeted Time 4 Min)

State the condition when  $\iint_R f(x, y) dA = \int_a^b \int_c^d f(x, y) dx dy = \int_a^b \int_c^d f(x, y) dy dx$  where R is the region of integration.

Answer ( Please click here to Add Answer )

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Question No : 44 of 52

Marks: 2 (Budgeted Time 4 Min)

Find derivative of the following vector-valued function.

$$\vec{r}(t) = e^{t^2} \hat{i} + t^2 \hat{j} + \sec 2t \hat{k}$$

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

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Question No : 45 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 : 46 of 52

Marks: 3 (Budgeted Time 6 Min)

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

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

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

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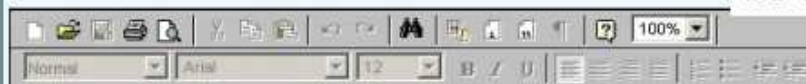
Question No : 47 of 52

Marks: 3 (Budgeted Time 6 Min)

Find the critical point for the given function  $f(x, y) = 6x^2 + xy - 2y^2$  along the line  $y = 3x + 1$  at which the absolute extrema of the function can occur.

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)

Determine the Fourier co-efficient  $b_n$  of the periodic function defined below:  
 $f(x) = 2x + 1 \quad 0 < x < 2$

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.

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

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

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Question No : 51 of 52

Marks: 5 (Budgeted Time 10 Min)

If  $f(x, y) = (x - 4) \ln(xy)$

Find both first order partial derivatives.

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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