Sir Syed University of Engineering & Technology

ANSWER SCRIPT

Date:	17th June , 2021
Roll Number:	SE-20F-022
Section:	A
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Course Name:	Calculus and Analytical Geometry
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Total number of pages being submitted:	

Date

Roll No: 022

a = 0

b = 2

c = 2

Qno. 1 (i)

$f(x,y) = (x+y)$

diff wrt x

$\frac{df}{dy} = 1+0 = 1$

diff wrt y

$\frac{df}{dy} = 0+1 = 1$

Qno 1: (ii)

$w = x^2+y^2$, $x = \cos t$, $y = d$,

at $t = a\pi$

$\frac{dw}{dx} = 2x$, $\frac{dw}{dy} = 2y$.

$\frac{dx}{dt} = -\sin t$, $\frac{dy}{dt} = \cos t$

$\Rightarrow \frac{dw}{dt} = \frac{dw}{dx}\cdot\frac{dx}{dt} + \frac{dw}{dy}\cdot\frac{dy}{dt}$

$\frac{dw}{dt} = (2x)(-\sin t) + (2y)(\cos t)$

$\begin{bmatrix} x = \cos t \\ y = \sin t \end{bmatrix}$

$\frac{dw}{dt} = -2\cos t \sin t + 2\cos t \sin t$

$\frac{dw}{dt} = 0$

Ques: 2 (i)

$\lim_{x\to 0} \frac{d}{(c+1)x^2} \quad \because (2+1)$

$\lim_{x\to 0} \frac{\sin x}{3x^2}$

Apply Lin.

$\frac{\sin 0}{3(0)^2}$

$\frac{0}{0}$ undefined.

Apply L Hopital Rule

$\lim_{x\to 0} \frac{\cos x}{6x}$

$\lim_{x\to 0} \frac{-\sin x}{6} = \frac{0}{6}$

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Qno: 2 (ii)

$f(x) = (b+1)(d)\pi x$

$f(x) = (2+1)(\sin)\pi x$

$= 3\sin\pi x$

$f'(x) = 3\pi\cos\pi x$

$f''(x) = -3\pi^2\sin\pi x$

$f(0) = \sin(\pi(0)) = 0$

$f'(0) = 3\pi\cos(\pi(0)) = 3\pi$

$f''(0) = -3\pi^2\sin(\pi(0)) = 0$

$f(x) = f(0) + f'(0)x + \frac{x^2}{2!} f''(0)$

$f(x) = 0 + 3\pi x + \frac{x^2}{2!}(0)$

$= 3\pi x$ Ans

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Q5 (i)

P (0,0,0)
Q (1,2,3)
R (0,2,2)

(a)

$\overrightarrow{PQ} = (1-0)\hat{i} + (2-0)\hat{j} + (3-0)\hat{k}$

$PQ = \hat{i} + 2\hat{j} + 3\hat{k}$

$\overrightarrow{PR} = (0-0)\hat{i} + (2-0)\hat{j} + (2-0)\hat{k}$

$= 0\hat{i} + 2\hat{j} + 2\hat{k}$

The area of parallelogram is determined by P, Q and R is:

$|\overrightarrow{PQ} \times \overrightarrow{PR}|:$

$$\begin{vmatrix} i & j & k \\ 1 & 2 & 3 \\ 0 & 2 & 2 \end{vmatrix}$$

$= i(2 \cdot 2 - 3 \cdot 2) - j(1 \cdot 2 - 3 \cdot 0) + k(1 \cdot 2 - 2 \cdot 0)$

$= i(4-6) - j(2-0) + k(2-0) = \{-2, -2, 2\}$

$|c| = \sqrt{(-2)^2 + (-2)^2 + (2)^2} = \sqrt{4+4+4}$

$= \sqrt{12} = 2\sqrt{3}$

Triangle Area.

$A = \frac{1}{2} 2\sqrt{3} \cdot \sqrt{3} \approx 1.732$

Q5 (ii)

~~Data:~~

~~P = (0, 2, 2)~~

~~V = (0, 0, -2)~~

Data.

$P = (0, 2, 2)$

$V = (0, 0, -2)$

Sol

$\overrightarrow{PV} = (0-0)i + (0-2)j + (-2-2)k.$

$= 0\hat{i} + 0\hat{j} - 4\hat{k}$

is parallel to the line with

$(x_1, y_1, z_1) = (0, 2, 2)$ give.

$x = 0 + 0t, \quad y = 0 - 2t, \quad z = 0 - 4t$

A

Q4 (i)

Here, $a = 0$, $d = \cos x$

$$= \int_0^{0\pi} \int_0^{\cos x} dy\, dx$$

$$= \int_0^{0\pi} |y|_0^{\cos x} dx$$

$$= \int_0^{0\pi} [\cos x - 0]\, dx = \int_0^{0\pi} (0)\, x\, dx$$

$$= \sin(0\pi) - 0$$

$$= \sin 0 - 0$$

$$= 0$$

Q4 (ii)

$\vec{A} = ai + bj$, $\vec{B} = 4j + 3k$

$a = 0$

$b = 2$

$\vec{A} = 0i + 2j$, $\vec{B} = 4j + 3k$.

Formula: $\theta = \cos^{-1}\left(\frac{u \cdot v}{|v||v|}\right)$

$A \cdot B = (0)(2) + (2)(4) + (0)(3)$

$0 + 8 + 0$

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$|A| = \sqrt{(2)^2} = \sqrt{4} = 2$

$|B| = \sqrt{(4)^2 + (3)^2} = \sqrt{25} = 5$

$\theta = \cos^{-1}\left(\frac{8}{4*5}\right)$

$\theta = \cos^{-1}\left(\frac{8}{20}\right)^{4} = \frac{4}{5}$

$\theta = 36.86°$

Qno 3 (i) $a = 0$ $b = 2$ $c = 2$.

$\int_0^{2+1} \cos^{-1} y \, dy.$

$I = \cos^{-1} y \int 1 \, dy - \int \frac{1}{\sqrt{1-y^2}} dy \Big]_0^3$

$= y \cos^{-1} y - \sqrt{1-y^2} \Big]_0^3$

$3\cos^{-1}(3) - \sqrt{1-(3)^2} - 0 - \sqrt{1+(0)^2}$

$3\cos^{-1}(3) - \sqrt{-8} - \sqrt{1}$

$3\cos^{-1}(3) - \sqrt{-8-1} + C$ A

Qno

a = 0

b = 2

c = 2

d =

=>

=>

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=>

=>

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=

=>

=>

=

Date

Q.no 3 (ii)

$a = 0$

$b = 1$

$c = 2$

$d = e^x$

$\Rightarrow \int_0^{\pi} (0+2+2)\, x^2 (e^x)\, dx$

$\Rightarrow \int_0^{\pi} 4x^2 e^x\, dx$

$\Rightarrow 4\int_0^{\pi} x^2 e^x\, dx$

$\Rightarrow 4[x^2 e^x - \int 2xe^x dx]$

$\Rightarrow 4[x^2 e^x - 2[xe^x - \int e^x dx]]$

$\Rightarrow 4[x^2 e^x - 2[xe^x - e^x]]$

$\Rightarrow 4[x^2 e^x - 2xe^x + 2e^x]$.

Applying limit

$\Rightarrow 4[[\pi^2 e^{\pi} - 2\pi e^{\pi} + 2e^{\pi}]]$

$\Rightarrow 4[[\pi e^{\pi} - 2\pi e^{\pi} + 2e^{\pi}] - 2]$

$\Rightarrow 127.27(4)$

$\Rightarrow 509.080 \text{ A}$