

First Name _____ Last Name _____

Lab 10**Find the principal unit normal vector $\mathbf{N}$ for the curve $\mathbf{r}(t)$.**

1) $\mathbf{r}(t) = (10 + t)\mathbf{i} + (9 + \ln(\cos t))\mathbf{k}, -\pi/2 < t < \pi/2$

A) $\mathbf{N} = (\cos t)\mathbf{i} + (\sin t)\mathbf{k}$

C) $\mathbf{N} = (-\cos t)\mathbf{i} - (\ln(\cos t))\mathbf{k}$

B) $\mathbf{N} = (-\cos t)\mathbf{i} - (\tan t)\mathbf{k}$

D) $\mathbf{N} = (-\sin t)\mathbf{i} - (\cos t)\mathbf{k}$

2) $\mathbf{r}(t) = (t^2 + 4)\mathbf{j} + (2t - 1)\mathbf{k}$

A) $\mathbf{N} = -\frac{1}{\sqrt{t^2 + 1}}\mathbf{j} + \frac{t}{\sqrt{t^2 + 1}}\mathbf{k}$

C) $\mathbf{N} = -\frac{1}{\sqrt{(t^2 + 1)^3}}\mathbf{j} + \frac{t}{\sqrt{(t^2 + 1)^3}}\mathbf{k}$

B) $\mathbf{N} = \frac{1}{\sqrt{t^2 + 1}}\mathbf{j} - \frac{t}{\sqrt{t^2 + 1}}\mathbf{k}$

D) $\mathbf{N} = \frac{1}{\sqrt{(t^2 + 1)^3}}\mathbf{j} - \frac{t}{\sqrt{(t^2 + 1)^3}}\mathbf{k}$

3) $\mathbf{r}(t) = (2t \sin t + 2 \cos t)\mathbf{i} + (2t \cos t - 2 \sin t)\mathbf{k}$

A) $\mathbf{N} = (\sin t)\mathbf{i} + (\cos t)\mathbf{k}$

C) $\mathbf{N} = (-\sin t)\mathbf{i} - (\cos t)\mathbf{k}$

B) $\mathbf{N} = -\frac{\sqrt{2}}{2}(\cos t)\mathbf{i} - \frac{\sqrt{2}}{2}(\sin t)\mathbf{k}$

D) $\mathbf{N} = (\cos t)\mathbf{i} - (\sin t)\mathbf{k}$

4) $\mathbf{r}(t) = (5 + 2 \sin 2t)\mathbf{i} + (5 + 2 \cos 2t)\mathbf{j} + 3t\mathbf{k}$

A) $\mathbf{N} = (-\cos 2t)\mathbf{i} - (\sin 2t)\mathbf{j}$

C) $\mathbf{N} = (-\sin 2t)\mathbf{i} - (\cos 2t)\mathbf{j}$

B) $\mathbf{N} = (\cos 2t)\mathbf{i} + (\sin 2t)\mathbf{j}$

D) $\mathbf{N} = (\sin 2t)\mathbf{i} + (\cos 2t)\mathbf{j}$

Compute the unit binormal vector of the curve.

5) $\mathbf{r}(t) = \langle 6 \sin t, 6 \cos t, -t \rangle$

A) $\mathbf{B}(t) = \frac{\langle -\cos t, \sin t, -1 \rangle}{\sqrt{37}}$

B) $\mathbf{B}(t) = \frac{\langle -\sin t, \cos t, -6 \rangle}{\sqrt{37}}$

C) $\mathbf{B}(t) = \frac{\langle \cos t, -\sin t, -6 \rangle}{\sqrt{37}}$

D) $\mathbf{B}(t) = \frac{\langle -\cos t, \sin t, -6 \rangle}{\sqrt{37}}$

6) $\mathbf{r}(t) = \langle t^2/2, -7t + 2, 1 \rangle$

A) $\mathbf{B}(t) = \langle 0, 0, \sqrt{t^2 + 49} \rangle$

B) $\mathbf{B}(t) = \langle 0, 0, -1 \rangle$

C) $\mathbf{B}(t) = \langle 0, 0, -\sqrt{t^2 + 49} \rangle$

D) $\mathbf{B}(t) = \langle 0, 0, 1 \rangle$

7) $\mathbf{r}(t) = (5 + t)\mathbf{i} + (9 + \ln(\sec t))\mathbf{j} - 10t\mathbf{k}, -\pi/2 < t < \pi/2$

A) $\mathbf{B} = -\mathbf{j}$

B) $\mathbf{B} = -\mathbf{k}$

C) $\mathbf{B} = \mathbf{k}$

D) $\mathbf{B} = \mathbf{j}$

Find the torsion of the space curve.

8) $\mathbf{r}(t) = \left(2 + 10 \sin \frac{2}{5}t \right) \mathbf{i} + 3t\mathbf{j} + \left(2 + 10 \cos \frac{2}{5}t \right) \mathbf{k}$

A) $\tau = \frac{6}{125}$

B) $\tau = \frac{6}{25}$

C) $\tau = \frac{12}{5}$

D) $\tau = -\frac{6}{25}$

9) $\mathbf{r}(t) = (2t - 7)\mathbf{i} + (t^2 - 2)\mathbf{j} + 7t\mathbf{k}$

A) $\tau = 0$

B) Undefined

C) $\tau = 1$

D) $\tau = -1$

10) $\mathbf{r}(t) = \langle 3 \sin t, 3 \cos t, -t \rangle$

A) $\tau = \frac{1}{\sqrt{10}}$

B) $\tau = \frac{1}{10}$

C) $\tau = -\frac{1}{\sqrt{10}}$

D) $\tau = \frac{1}{9}$

Answer Key

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- 1) D
- 2) B
- 3) C
- 4) C
- 5) D
- 6) D
- 7) C
- 8) A
- 9) A
- 10) B