



LESSON 6

MA 26100-FALL 2023

DR. HOOD

LESSON 6 - WARM UP

$$\begin{aligned}x &= \sqrt{2}t \\ y &= t^2 + 1 \\ z &= 1 - 4t\end{aligned}$$

(Fall 16 Exam 1 #4) Let (a, b, c) be the point of intersection of the curve $\vec{r}(t) = \langle \sqrt{2}t, t^2 + 1, 1 - 4t \rangle$ with the surface $x^2 + 2y - z = 0$. What is the value of $a^2 + 2b$?

$$x^2 + 2y - z = 0$$

$$(\sqrt{2}t)^2 + 2(t^2 + 1) - (1 - 4t) = 0$$

$$2t^2 + 2t^2 + 2 - 1 + 4t = 0$$

$$4t^2 + 4t + 1 = 0$$

$$(2t + 1)^2 = 0$$

$$t = -\frac{1}{2}$$

$$\begin{aligned}a^2 + 2b &= \\ (-\frac{\sqrt{2}}{2})^2 + 2(\frac{5}{4}) &= \frac{1}{4} + \frac{5}{2} = 3\end{aligned}$$

$$\begin{aligned}(a, b, c) &= \vec{r}\left(-\frac{1}{2}\right) \\ &= \left(-\frac{\sqrt{2}}{2}, \left(-\frac{1}{2}\right)^2 + 1, 1 - 4\left(-\frac{1}{2}\right)\right) \\ &= \left(-\frac{\sqrt{2}}{2}, \frac{5}{4}, 3\right)\end{aligned}$$

a) 3

b) 4

c) 5

d) 6

LABOR DAY HOLIDAY

- **Labor Day Holiday is Monday Sep 4, 2023**
 - No lecture on Monday
 - No HW due Monday
 - No Office Hours on Monday
 - Math Resource Room is closed

QUIZ RUBRIC

- Quiz Grading:
 - (2 points) Write your name on the paper
 - (3 points) Multiple Choice Question
 - (5 points) Partial Credit Question
 - **Must show your work to receive full credit**
 - If you just write D, you will earn 1 point, even if D is the correct choice
- Link to Quiz Rubric:
https://www.math.purdue.edu/~kthood/docs/MA261_Fall2023/rubric_quizzes_ma261_fa23_update_9-1-23.pdf

QUIZ RUBRIC

261 Quiz 01

ABCD

Quiz Grading:

- (2 points) Write your name on the paper
- (3 points) Multiple Choice Question
- (5 points) Partial Credit Question
 - **Must show your work to receive full credit**
 - If you just write D, you will earn 1 point, even if D is the correct choice

Problem 1

→ (2 points)

Write your name below (2 points). One problem will be graded correct/incorrect (3 points). Another problem will be graded for partial credit based on work shown (5 points).

Answer = _____

Problem 2

→ (3 points)

The area of the triangle with vertices $(2, 1, 1)$, $(1, 2, 1)$, $(1, 1, 2)$ is

- A. $\frac{3}{2}$
- B. $\sqrt{2}$
- C. 2
- D. $\frac{7}{2}$
- E. $\frac{\sqrt{3}}{2}$

Problem 3

→ (5 points)

A line l passes through the points $A(1, -2, 1)$ and $B(2, 3, -1)$. At what point does this line intersect with the xy -plane?

// To receive the full 5 points, you must show all your work on this problem. //

- A. $(\frac{5}{2}, \frac{-1}{2}, 0)$
- B. $(\frac{5}{2}, \frac{1}{2}, 0)$
- C. $(\frac{3}{2}, \frac{1}{2}, 0)$
- D. $(\frac{3}{2}, \frac{-1}{2}, 0)$
- E. $(\frac{3}{2}, -1, 0)$

POLL 1

$$\vec{T}(t) = \frac{\vec{r}'(t)}{|\vec{r}'(t)|}$$

Find the unit tangent vector of

$$\vec{r}(t) = \langle \cos(t), \sin(t), 2t \rangle$$

$$\vec{r}'(t) = \langle -\sin(t), \cos(t), 2 \rangle$$

$$|\vec{r}'| = \sqrt{(-\sin t)^2 + (\cos t)^2 + 2^2}$$

$$= \sqrt{1 + 4}$$

$$= \sqrt{5}$$

$$a) \vec{T}(t) = \frac{1}{\sqrt{5}} \langle -\sin(t), \cos(t), 2 \rangle$$

$$b) \vec{T}(t) = \left\langle -\frac{1}{\sqrt{5}}, \frac{1}{\sqrt{5}}, \frac{2}{\sqrt{5}} \right\rangle$$

$$c) \vec{T}(t) = \langle -\sin(t), \cos(t), 2 \rangle$$

POLL 2

$$\vec{r}(t) = \langle 2t-1, t^2, t^2-2 \rangle = \langle 3, 4, 2 \rangle$$

$$2t-1=3$$
$$\boxed{t=2}$$

(Spring 18 Exam 1 #2) If L is the tangent line to the curve $\vec{r}(t) = \langle 2t-1, t^2, t^2-2 \rangle$ at $(3,4,2)$, find the point where L intercepts the xy -plane.

a) $(2,1,0)$

b) $(1,2,0)$

c) $(2, -2, 0)$

d) $(2, 2, 0)$

tangent vector:

$$\vec{r}'(t=2) = \langle 2, 2t, 2t \rangle \Big|_{t=2}$$
$$= \langle 2, 4, 4 \rangle \text{ direction vector}$$

Tangent Line:

$$\langle x, y, z \rangle = \langle 3, 4, 2 \rangle + t \langle 2, 4, 4 \rangle$$
$$= \langle 3+2t, 4+4t, 2+4t \rangle$$

xy-plane:

$$z=0$$

$$x = 3 + 2\left(-\frac{1}{2}\right) = 2$$

$$y = 4 + 4\left(-\frac{1}{2}\right) = 2$$

$$z = 2 + 4\left(-\frac{1}{2}\right) = 0$$
$$t = -\frac{1}{2}$$

MUDDIEST POINT

What was the muddiest point from today's lecture?

- a) Derivatives of Vector-Valued Functions
- b) Tangent Vector
- c) Unit Tangent Vector
- d) Integrals of Vector-Valued Functions
- e) None – understood everything today