WRITE YOUR NAME:

MAC 2313 B51 Spring 2024

Written homework #3

Due Tuesday January 30th, in Canvas

Question 1. Consider the vectors $\mathbf{u} = \langle 7, 0, 0 \rangle$ and $\mathbf{v} = \langle 2, 3, 0 \rangle$.

(i) Compute $\mathbf{u} \times \mathbf{v}$.

(ii) Draw a rough sketch of $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{u} \times \mathbf{v}$ in $\mathbb{R}^3$.

(iii) Draw a rough sketch of $\mathbf{u}$ and $\mathbf{v}$ in the xy-plane, and verify that $|\mathbf{u} \times \mathbf{v}|$ is equal to the area of the parallelogram spanned by $\mathbf{u}$ and $\mathbf{v}$.

Question 2.

Find the distance from the point $(7, 5, 3)$ to the plane $2x + 3y + 6z = 12$.

Question 3. Do the lines

$$x = t, \qquad y = 2t + 1, \qquad z = 3t + 4$$

and

$$x = 2s - 2, \qquad y = 2s - 1, \qquad z = 3s + 1$$

intersect each other at only one point? If so, find a plane that contains both lines.

Question 4. Consider the curve in $\mathbb{R}^3$ defined by $\mathbf{r}(t) = \langle 10\cos t, 2\sin t, 1\rangle$.

(i) What kind of curve is it?

(ii) Find all points where the curve intersects the plane $y = 1$.