TMATH 126 Midterm Review Workshop

Unless otherwise stated let $\vec{u} = \langle 2, -3, 5 \rangle$ and $\vec{v} = \langle 4, -1, 2 \rangle$

1a: Coordinates and Vectors in 2D and 3D

a Draw vectors $\vec{u}$ and $\vec{v}$ in 2D and 3D. Then draw $\vec{u} + \vec{v}$ using the tip-to-tail method.

b Draw and label $\vec{u} - \vec{v}$ on the same coordinate system.

1b: Dot Product, Cross Product

a Explain the applications of the dot and cross product. (ie what do they tell/give us)

b Find the scalar projection of $\vec{u}$ onto $\vec{v}$.

c Find the vector projection of $\vec{v}$ onto $\vec{u}$.

d Find the angle between $\vec{u}$ $\vec{v}$.

e Find the area of a parallelogram with the points $A(0, 1, 3)$, $B(1, 3, 5)$, $C(5, 7, 5)$, $D(4, 5, 3)$.

1c: Equations of Lines and Planes

a Given point $A(1, 1, 1)$ and $\vec{d} = \langle 10, -10, 50 \rangle$ Write the vector equation of a line in 2D and 3D that contains point A moves is parallel to $\vec{d}$.

b Find the equation of a plane with points $(4, -3, 1)$, $(-3, -1, 1)$, and $4, -2, 8$.

c Determine if the planes given by $4x - 9y - z = 2$ and $x + 2y - 14z = -6$ are parallel, orthogonal, or neither.

d Determine where the line $\vec{r}(t) = \langle -2t, 2 + 7t, -1 - 4t \rangle$ and the plane given by $\langle 4x + 9y - 2z = -8$

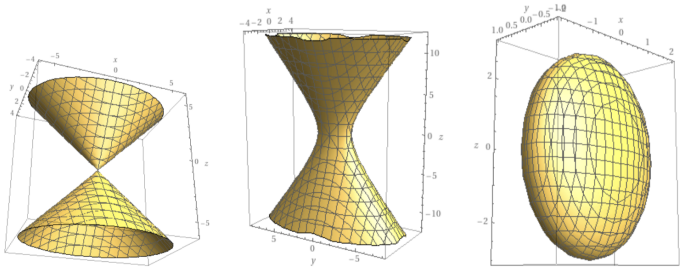
e Find the line of intersection of the planes given by $3x + 6y - 5z = -3$ and $-2x + 7y - z = 24$.

f Find the point on the plane $3x + 4y + z = 1$ that is closest to the point $(1, 0, 1)$.

1d: Equations of Cylinders and Other Simple Surfaces

Exercise 2 (Matching). *Match each equation to its graph and explain your choices.*

$9x^2 + 36y^2 + 4z^2 = 36$ $\quad 4x^2 + 9y^2 - 4z^2 = 0$ $\quad 36x^2 + 9y^2 - 4z^2 = 36$



Identify and sketch the following 3D surfaces.

a $x^2 + y^2 + z^2 = 1$

b $x = cost$ and $y = sint$

c $x^2 + \frac{y^2}{9} + \frac{z^2}{4}$

d $z = 4z^2 + y^2$