Homework I Second-Half

Due in class July 11 2017

0. Read The Following Sections:
   Chapter 10. Vectors and the Geometry of Space: Section 10.4 The Cross Product, 10.5 Equations of Lines and Surfaces

1. \( \mathbf{u} = <1, 2, 4>, \mathbf{v} = <-2, 1, 3> \). Compute \( \mathbf{u} \times \mathbf{v} \).

2. \( \mathbf{u} \cdot \mathbf{v} = \sqrt{3} \) and \( \mathbf{u} \times \mathbf{v} = <1, 2, 2> \). Compute the angle between \( \mathbf{u} \) and \( \mathbf{v} \).

3. \( l \) is a line passing through \( Q \) and \( R \). \( P \) is a point not on the line \( l \).
   Show that the distance \( d \) from \( P \) to \( l \) is given by
   \[ d = \frac{|\overrightarrow{QR} \times \overrightarrow{QP}|}{|\overrightarrow{QR}|} \]

4. Find the volume of the parallelepiped determined by the following vectors:
   \( \mathbf{u} = <1, 2, 3>, \mathbf{v} = <-1, 1, 2>, \mathbf{w} = <2, 1, 4> \)

5. Find a parametric equation that passes through the points \((1, 2, 3)\) and \((4, 5, 6)\).

6. Find a parametric equation for the line through \((2, 4, 6)\) that is perpendicular to the plane \( x - y + 3z = 7 \)

7. Find symmetric equation for the line that passes through the point \((1, 5, 6)\) and is parallel to the vector \(<-1, 2, 3>\)

8. Find an equation of the plane passing through \((1, 2, 3)\) with normal vector \(<0, 1, 4>\)
9. Find an equation of the plane passing through (0, 2, 4), (1, −3, 2) and 
(−3, −2, 1)

10. Find the distance from (1, 2, 4) to the plane $3x + 2y + z - 5 = 0$

11. Find the distance from (1, 2, 4) to the line $\begin{align*}
\frac{x-1}{3} &= \frac{y+2}{4} = \frac{z-2}{12}
\end{align*}$

12. Find the equation of the line of intersection $l$ of the planes $x+2y+3z = 1$
and $-x + 2y - 3z = 2$