## Assignment 8

MATH 2050

## For practice and extra credit only.

1. Consider an arbitrary quadrilateral in a plane. Connect the midpoints of its sides to get a new quadrilateral. What do you notice about this new quadrilateral? Prove you conjecture using addition of vectors.
Hint: start from looking at midpoints of various squares and rectangles and then take a more general quadrilateral.
2. Find whether two lines with direction vectors $\left[\begin{array}{l}1 \\ 2 \\ 3\end{array}\right]$ and $\left[\begin{array}{c}-1 \\ 3 \\ 3\end{array}\right]$ respectively intersect at a point if it is known that the first line goes via point $(0,-2,4)$ and the second via point $(1,1,2)$.
3. Write equation of line going via points $(1,2)$ and $(4,5)$. Does point A belong to the line? If not, what is the distance from the point to the line?
a) $\mathrm{A}(11,12)$
b) $\mathrm{A}(5,7,9)$
4. Find the projection of vector $\vec{v}=\left[\begin{array}{c}2 \\ -5 \\ 7\end{array}\right]$ onto vector $\vec{u}=\left[\begin{array}{l}2 \\ 1 \\ 3\end{array}\right]$. Find the angle between the vectors.
5. Consider triangle with vertices at points

$$
(1,-1,1), \quad(3,-6,8), \quad(1,-2,4),
$$

(a) find the area of the triangle
(b) find equation of the plane to which the triangle belongs.
6. Give an example of a plane which is orthogonal to the plane $7 x-y-4 z=6$.
7. Give an example of a line which is orthogonal to the vector $\left[\begin{array}{c}1 \\ -2 \\ 5\end{array}\right]$. Explain.

