

Due September 15

Name

Directions: Be sure to follow the guidelines for writing up projects as specified in the course information sheet (passed out on the first day of class). Whenever appropriate, use in-line citations, including page numbers and people consulted when you present information obtained from discussion, a text, notes, or technology. **Only write on one side of each page.**

“Education: That which discloses to the wise and disguises from the foolish their lack of understanding.”
-Ambrose Bierce, writer (1842-1914)

Project Description

For this project please submit your efforts on exactly one of the following. (However, you should be able to do every problem in the list.)

1. Given two distinct lines in three-dimensional Euclidean space exactly one of the following three things must happen: the lines are parallel in the sense that they have parallel direction vectors, or the lines meet at exactly one point, or the lines are **skew** in that they are neither parallel nor meet.
 - (a) In which, if any, of these three cases is there a single plane containing both lines? Give a geometric explanation.
 - (b) Determine if the following two lines are parallel, skew, or meet in a single point and, if they lie in a single plane find an equation of that plane.

$$\begin{aligned}\vec{r}(t) &= \langle 1, 1, 0 \rangle + t \langle 1, -1, 2 \rangle \\ \vec{r}(t) &= \langle 4, -2, 2 \rangle + t \langle -1, 1, 0 \rangle\end{aligned}$$

2. Using material we have studied, carefully explain why the distance between the parallel planes $ax + by + cz = d_1$ and $ax + by + cz = d_2$ is given by the following formula. Be sure to explain what we mean by the “distance between two parallel planes”.

$$D = \frac{|d_1 - d_2|}{\sqrt{a^2 + b^2 + c^2}}$$