Math 3495, Calculus II
Abedi, Fall 2006

1. The angle between two vectors $\boldsymbol{U}$ and $\boldsymbol{V}$:

$$\cos\theta = \frac{\boldsymbol{U}\cdot\boldsymbol{V}}{\|\boldsymbol{U}\|\,\|\boldsymbol{V}\|} \qquad \sin\theta = \frac{\|\boldsymbol{U}\times\boldsymbol{V}\|}{\|\boldsymbol{U}\|\,\|\boldsymbol{V}\|}$$

2. The projection of a vector $\vec{U}$ over a vector $\vec{W}$:

$$proj_{\vec{W}}\vec{U} = \frac{\vec{U}\cdot\vec{W}}{\|\vec{W}\|^2}\vec{W}$$

3. Line: $\dfrac{x-x_0}{a} = \dfrac{y-y_0}{b} = \dfrac{z-z_0}{c}$ or $\begin{cases} x = x_0 + at \\ y = y_0 + bt \\ z = z_0 + ct \end{cases}$ or $\vec{r} = \vec{r}_0 + t\vec{u}$

4. Plane: $a(x-x_0)+b(y-y_0)+c(z-z_0)=0$, $ax+by+cz+d=0$

5. The angle between two planes with normal lines $\boldsymbol{N}_1$ and $\boldsymbol{N}_2$:

$$\cos\theta = \frac{|\boldsymbol{N_1}\cdot\boldsymbol{N_2}|}{\|\boldsymbol{N_1}\|\,\|\boldsymbol{N_2}\|}$$

6. The distance d between a point P and a plane with normal line $\boldsymbol{N}$:

$$\boldsymbol{d} = \frac{|\vec{PQ}\cdot\boldsymbol{N}|}{\|\boldsymbol{N}\|}$$, Q is a point on the plane.

7. The distance D between a point $P_0=(x_0,y_0,z_0)$ and a plane $ax+by+cz+d=0$:

$$D = \frac{|ax_0+by_0+cz_0+d|}{\sqrt{a^2+b^2+c^2}}$$

8. The distance between a point P and a line in the direction of $\boldsymbol{U}$:

$$\boldsymbol{d} = \frac{\|\vec{PQ}\times\boldsymbol{U}\|}{\|\boldsymbol{U}\|}$$, Q is a point on the line.