SEPTEMER 09 **TBL**

MATH 20A – DISTANCE FORMULAE CRIB SHEET

1. *Distance from* **point** *to* **plane**.

   Let the point be $\mathbf{r}_P = (x_P, y_P, z_P)$. Let the plane be $\mathbf{n} \cdot \mathbf{r} = c$. The distance is

   $$\frac{\mathbf{n} \cdot \mathbf{r}_P - c}{|\mathbf{n}|}$$

   made into a positive quantity.

2. *Distance from* **point** *to* **line**.

   Let the point be $\mathbf{r}_P = (x_P, y_P, z_P)$. Let the line be $\mathbf{r}(t) = \mathbf{r}_l + t\mathbf{a}_l$. The distance is

   $$\frac{|(\mathbf{r}_P - \mathbf{r}_l) \times \mathbf{a}_l|}{|\mathbf{a}_l|}$$

   which will always be a positive quantity.

3. *Distance from* **line** *to* **line**.

   Let the line be $\mathbf{r}(t) = \mathbf{r}_l + t\mathbf{a}_l$. Let the other line be $\mathbf{r}(t) = \mathbf{r}_m + t\mathbf{a}_m$. The distance is

   $$\frac{(\mathbf{r}_l - \mathbf{r}_m) \cdot (\mathbf{a}_l \times \mathbf{a}_m)}{|(\mathbf{a}_l \times \mathbf{a}_m)|}$$

   made into a positive quantity.

4. *Distance from* **plane** *to a* **parallel plane**.

   Let one plane be $\mathbf{n} \cdot \mathbf{r} = c$. You should be able to make the other plane into $\mathbf{n} \cdot \mathbf{r} = c'$. (If you can't, it isn't a *parallel* plane.)

   The distance is

   $$\frac{c - c'}{|\mathbf{n}|}$$

   made into a positive quantity.

5. *Distance from* **point** *to* **point** *is easy.*