Three-Dimensions

Conventions:

- The direction of the z-axis is determined by the right-hand rule: if you curl the fingers of your right hand around the z-axis in the direction of a 90° counterclockwise rotation from the positive x-axis to the positive y-axis, then your thumb points in the positive direction of the z-axis. Note, picture from Stewart's text.
- When drawing axis, the arrows denote the positive side of an axes.

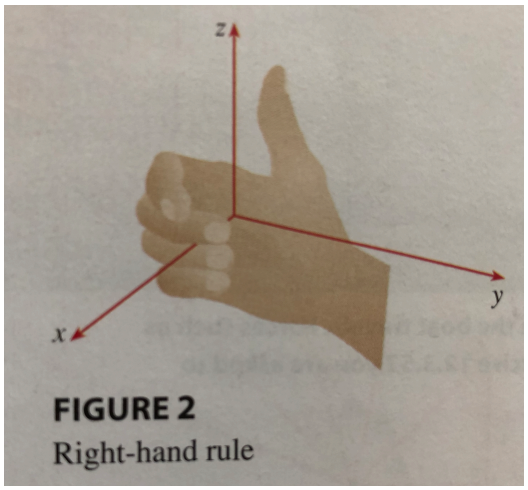
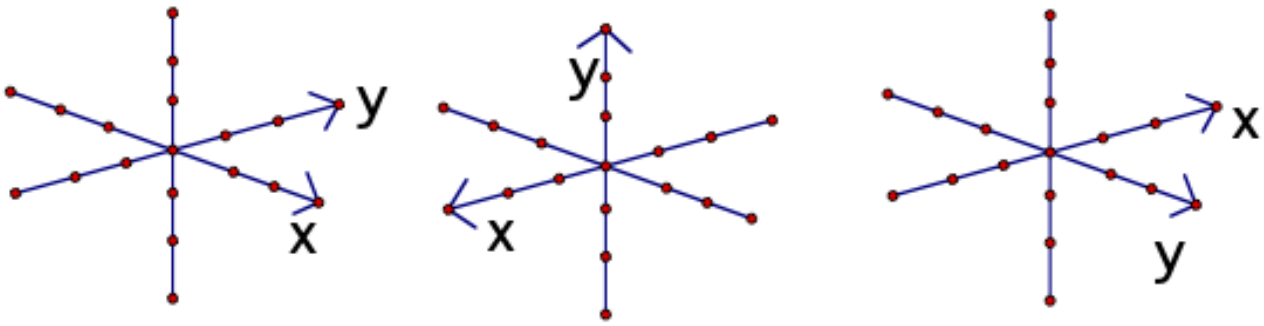


FIGURE 2
Right-hand rule

While working in a group make sure you:

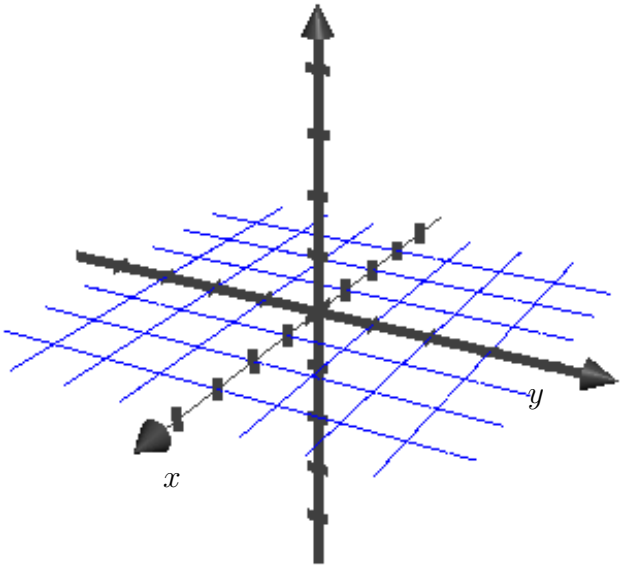
- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

1. For each of the following set of axis below, identify the positive z-axis:



2. Identify the xy plane on the the axis on the far left.
3. Identify the yz plane on the axis in the middle.

4. Use the coordinate axis provided on the right for the following questions:



(a) Plot the points (with rectangular coordinates)
$A = (0, 0, 0)$,
$B = (1, 2, 3)$, &
$C = (0, -2, 1)$.

Note that the points plotted in part (a) cast 'shadows' on the xy-plane. That is, if we drop a perpendicular from a point $P = (a, b, c)$ to the xy-plane, the point $Q = (a, b, 0)$ is the *projection* of P to the xy-plane.

(b) Find the xy-plane projections for each of the three points you plotted in part (a). Graph the projections and explain why I described these projections as 'shadows'.

(c) Find the yz-plane projections of the three points you plotted in part (a).

(d) Find the distance between the points A and B.

(e) Find the distance between points B and C.