VECTORS

1. Describe (or draw) the set of points x in $\mathbb{R}$ that satisfy the equation $(x-2)^2 = 9$.

2. Describe (or draw) the set of points (x, y) in $\mathbb{R}^2$ that satisfy the equation $(x-2)^2 + (y-1)^2 = 9$.

3. Describe (or draw) the set of points (x, y, z) in $\mathbb{R}^3$ that satisfy the equation $(x-2)^2 + (y-1)^2 + z^2 = 9$.

4. Describe (or draw) the set of points (x, y, z) in $\mathbb{R}^3$ that satisfy the equation $(x-2)^2 + (y-1)^2 + z^2 \leq 9$.

5. Adding an extra component to a 2-component vector gives us a vector in 3 dimensions.

    a) Find the vector from $P(1, 2, 3)$ to $Q(-3, 5, -3)$.

    b) Calculate the magnitude of the vector $\vec{PQ}$.

    c) Find a unit vector parallel to $\vec{PQ}$.

    d) How many different unit vectors are parallel to $\vec{PQ}$?

6. Let $\mathbf{u} = \langle 1, 2, 3 \rangle$ and $\mathbf{v} = \langle -1, -2, 3 \rangle$. Calculate the following.

    a) $\mathbf{u} + \mathbf{v}$.

    b) $\mathbf{u} - \mathbf{v}$.

    c) $2\mathbf{u} + \mathbf{v}$.

7. A drone is flying horizontally due north at a speed of 5 mi/hr when it encounters a horizontal crosswind blowing northwest at 8 mi/hr and an updraft blowing up at 1 mi/hr.

    a) Find the velocity vector of the drone.

    b) Find the speed of the drone.