1. (20 points) Let $u = \langle 1, 2, 3\rangle$ and $v = \langle -1, 0, 3\rangle$ be two defined vectors. Compute $|2u - 3v|$.

Solution:

$$2u - 3v = 2(1, 2, 3) - 3(-1, 0, 3) = (2, 4, 6) + (3, 0, -9) = (5, 4, -3)$$

so

$$|2u - 3v| = |(5, 4, -3)| = \sqrt{5^2 + 4^2 + (-3)^2} = \sqrt{45}$$

2. (20 points) Find the distance from $(2, -1, 3)$ to the yz-plane.

Solution: The closest point is $(0, -1, 3)$, which has a distance of 2.

3. (20 points) Write the equation of a sphere with center $(2, -1, 3)$ and radius 5.

Solution:

$$(x - 2)^2 + (y + 1)^2 + (z - 3)^2 = 25$$