

## MATH 242 QUIZ 1

You need to show all your work to get a full credit.

**Problem 1**(5 points) Let  $x^2 + y^2 + z^2 + 2y - 6z = 28$ . Show that the given equation represents a sphere, and find its radius and center.  
solution) Completing the square, we have

$$x^2 + (y + 1)^2 + (z - 3)^2 = 38.$$

Hence, it is a equation of sphere with radius  $\sqrt{38}$  and center  $(0, -1, 3)$ .

**Problem 2**(5 points) Let  $\vec{a} = \langle 1, 2, 5 \rangle$  and  $\vec{b} = \langle -1, 0, 3 \rangle$ , find  $2\vec{a} - 3\vec{b}$ .

solution)

$$2\vec{a} - 3\vec{b} = 2 \langle 1, 2, 5 \rangle - 3 \langle -1, 0, 3 \rangle = \langle 5, 4, 1 \rangle .$$

**Problem 3**(5 points) Find the unit vector in the direction of  $2\vec{i} - \vec{j} + 2\vec{k}$ .

solution) The unit vector is

$$\frac{2\vec{i} - \vec{j} + 2\vec{k}}{\sqrt{4 + 1 + 4}} = \frac{2}{3}\vec{i} - \frac{1}{3}\vec{j} + \frac{2}{3}\vec{k}.$$

**Problem 4**(5 points) Find the cosine of the angle between  $\vec{a} = 2\vec{i} - 2\vec{j} + \vec{k}$  and  $\vec{b} = -\vec{i} + 4\vec{j} + 2\vec{k}$ .

solution)

$$\cos \theta = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}||\vec{b}|} = \frac{-2 - 8 + 2}{\sqrt{3}\sqrt{21}} = -\frac{8}{3\sqrt{21}}.$$