

Solutions of quiz # 1.

Ver.

Math241 DD7, Quiz 1, Sept 10

Name:

Question 1: [5pt] Find an equation of the plane through the points $(2, 0, 0)$, $(5, 2, 1)$ and $(4, 1, 1)$.

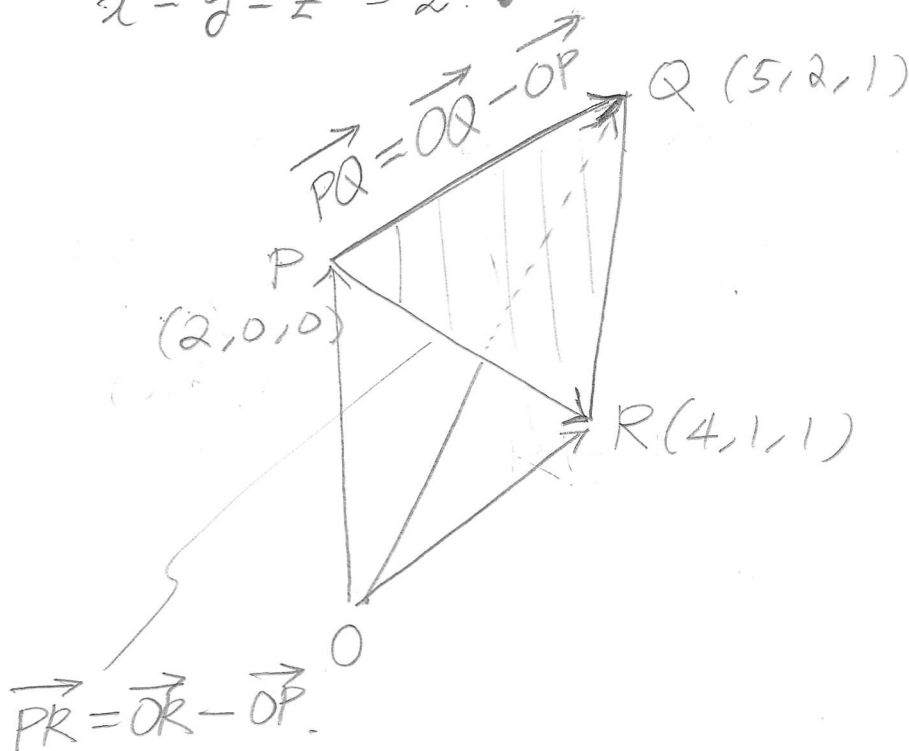
Sol.) $\langle 5, 2, 1 \rangle - \langle 2, 0, 0 \rangle = \langle 3, 2, 1 \rangle,$
 $\langle 4, 1, 1 \rangle - \langle 2, 0, 0 \rangle = \langle 2, 1, 1 \rangle,$

$$\vec{n} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 3 & 2 & 1 \\ 2 & 1 & 1 \end{vmatrix} = \langle 1, -1, -1 \rangle,$$

$$P = (2, 0, 0) \text{ (or } (5, 2, 1) \text{ or } (4, 1, 1)),$$

$$(x-2) - y - z = 0,$$

$$x - y - z = 2.$$



Question 2: [5pt] Reduce the equation

$$2x^2 - y^2 - 3z^2 + 4x + 2y = 0$$

to a standard form, classify the surface and sketch it.

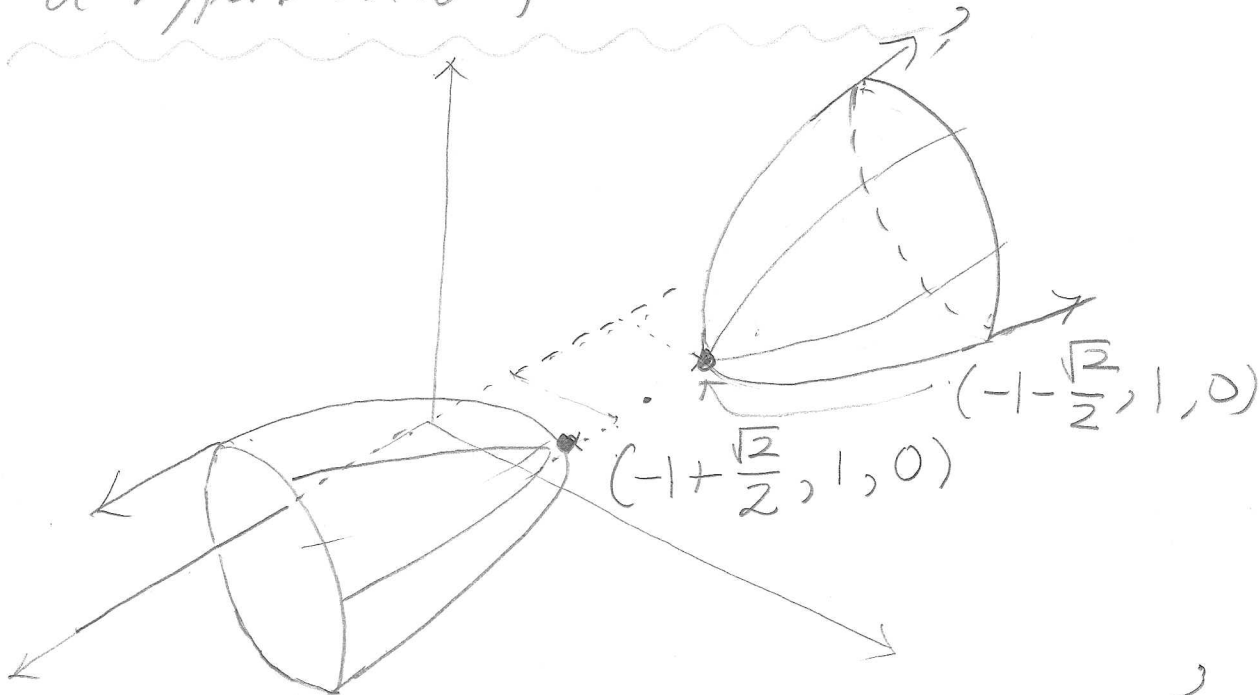
Sol) $2(x^2 + 2x + 1) - 1 - (y^2 - 2y + 1) - 1 - 3z^2 = 0,$

$$2(x+1)^2 - 2 - (y-1)^2 + 1 - 3z^2 = 0,$$

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

$$\frac{(x+1)^2}{\frac{1}{2}} - (y-1)^2 - \frac{z^2}{\frac{1}{3}} = 1,$$

a hyperboloid of two sheets



For vertices, $\frac{(x+1)^2}{\frac{1}{2}} = 1, (x+1)^2 = \frac{1}{2}, x+1 = \pm \frac{1}{\sqrt{2}}$

$$x = -1 \pm \frac{1}{\sqrt{2}}$$