

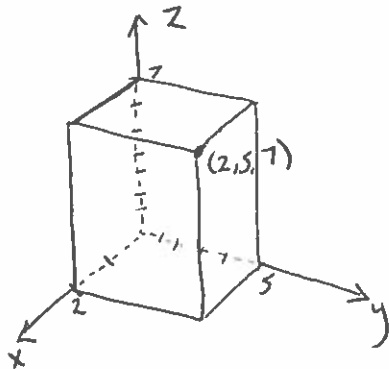
Solutions

Quiz 1

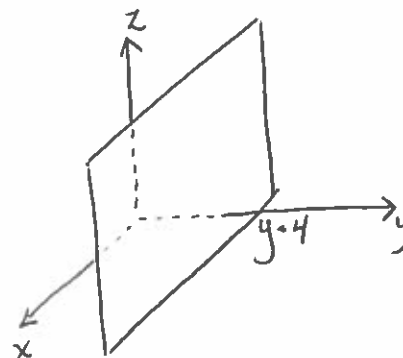
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Show all work. Incomplete answers may receive little or no credit. All numerical answers should be exact, with no decimal approximations.

1. (a) Draw a picture to clearly show the point $(2,5,7)$ in xyz -space.



(b) Draw a picture to clearly show the surface $y = 4$ in \mathbb{R}^3 .

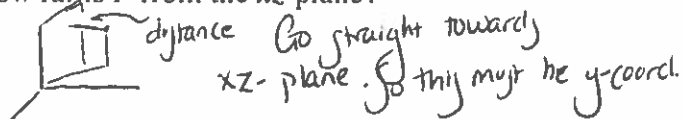


2. Consider the point $P(-6, 5, 2)$.

(a) Find the distance of P from the origin.

$$\begin{aligned} D &= \sqrt{(-6-0)^2 + (5-0)^2 + (2-0)^2} \\ &= \sqrt{36 + 25 + 4} \\ &= \sqrt{65} \end{aligned}$$

(b) How far is P from the xz -plane?



$$D = 5$$

(c) Write down the equation of a sphere with center P which just touches the xz -plane at one point.

$$\begin{aligned} (x-h)^2 + (y-e)^2 + (z-k)^2 &= r^2 \\ (x-(-6))^2 + (y-5)^2 + (z-2)^2 &= 5^2 \\ (x+6)^2 + (y-5)^2 + (z-2)^2 &= 25 \end{aligned}$$

If sphere touches at one point, the radius must be distance from center to that point. But this is the distance from (b). So $r=5$.

(d) Describe in words and give the equation of the intersection of that sphere with the xy -plane.

In the xy -plane, $z=0$. So we have

$$\begin{aligned} (x+6)^2 + (y-5)^2 + (0-2)^2 &= 25 \\ (x+6)^2 + (y-5)^2 + 4 &= 25 \\ (x+6)^2 + (y-5)^2 &= 21 \end{aligned}$$

So this is a circle in \mathbb{R}^3 in xy -plane with center $(-6, 5, 0)$ and radius $\sqrt{21}$

