Panel 1

Last time

Coordinate system in $\mathbb{R}^3$

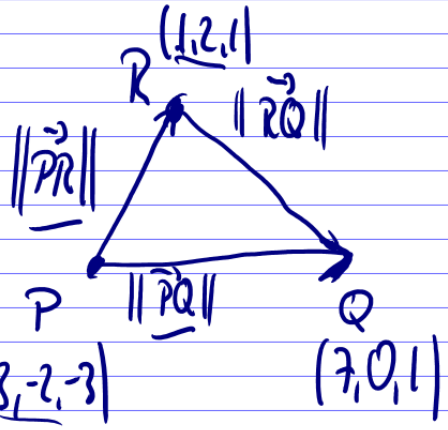
Distance formula

3D Objects
- spheres $(x-a)^2+(y-b)^2+(z-c)^2=r^2$
- sheets $z=1$
- cylinders $x^2+y^2=1$

Vectors
- adding, subtr.
- mult. by #
- length or norm
- unit vector

1

Panel 2



$\vec{PQ}=(4,2,4)$, $\|\vec{PQ}\|=6$

$\vec{PR}=(-2,4,4)$, $\|\vec{PR}\|=6$

$\vec{RQ}=(6,-2,0)$, $\|\vec{RQ}\|=\sqrt{40}$

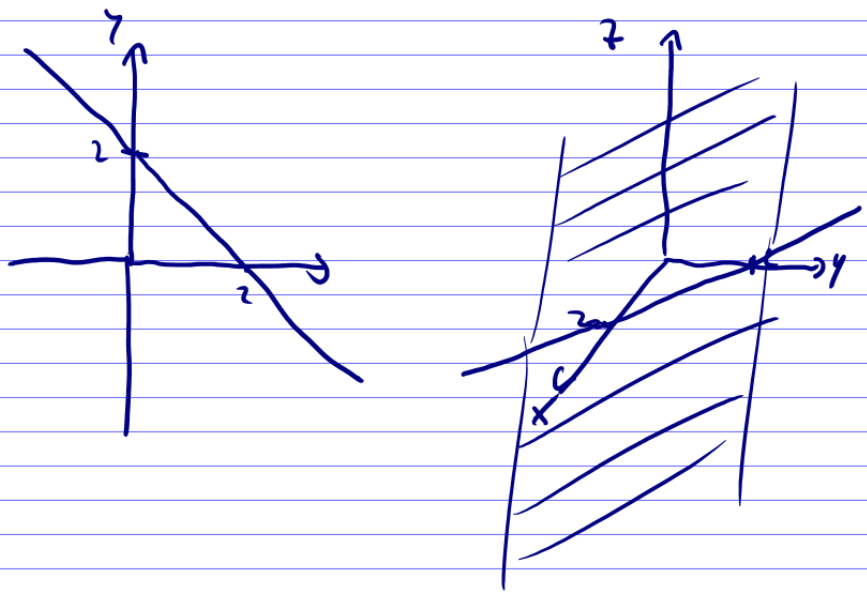
$(-2,4,2)$ length 8 $\rightsquigarrow 8\cdot\frac{1}{\sqrt{24}}(-2,4,2)$

$8\cdot\frac{1}{\sqrt{6}}(-1,2,1)$

2

Panel 3

$x+y=2$ $\quad y=2-x$ line in $\mathbb{R}^3$



3

Panel 4

Length of $(1,2,3)$ is $\sqrt{1^2+2^2+3^2}=\sqrt{14}$

Length of $\frac{1}{\sqrt{14}}(1,2,3)$ is

$$\left\| \left(\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}\right) \right\| = \sqrt{\frac{1}{14}+\frac{4}{14}+\frac{9}{14}} = \sqrt{\frac{14}{14}} = 1$$

Length of $10\,\frac{1}{\sqrt{14}}(1,2,3)$ is 10

4

Panel 5

Calc 3 - Quiz #1

(1) Find the distance between $P(-1,2,0)$ and $Q(2,1,1)$.

(2) Find radius of sphere $x^2+y^2+z^2-6x+4y-2z=11$

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Panel 6

(3) Describe 3D object given by $x^2+z^2=4$

(4) Find a vector in direction $\langle -3,4,5\rangle$ with length 2.

6

Panel 7

Standard unit normal vectors

Def: $\vec{i} = \langle 1,0,0 \rangle$, $\vec{j} = \langle 0,1,0 \rangle$, $\vec{k} = \langle 0,0,1 \rangle$ } standard unit vectors

Thm: Every vector in $\mathbb{R}^3$ is a linear combination of standard unit vectors

Ex: If $\vec{v} = \langle -1, 2, 3 \rangle$ then

$\vec{v} = -1\,\vec{i} + 2\,\vec{j} + 3\,\vec{k}$

$3\vec{i} - 2\vec{k} = \langle 3, 0, -2 \rangle$

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