

Essentials of Analytical Geometry and Linear Algebra. Lecture 8.

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End of Lecture #7

- Part 1. Straight line in 3D space
- Part 2. Plane in 3D space. Equations

Lecture 8. Outline

- Part 1. Problem solving. Examples. Visualization
- Part 2. Grand competition

Part 1. Problem solving. Examples. Visualization

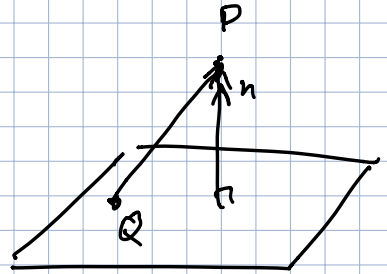
$$P(x_0, y_0, z_0)$$

distance?

$$x - 2y + 3z - 28 = 0$$

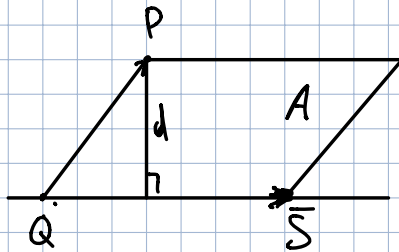
plane

$$\frac{ax_0 + by_0 + cz_0 + d}{\sqrt{a^2 + b^2 + c^2}}$$



$$P(0, 2, 3)$$

$$\text{line } l: \frac{x-4}{2} = y-7 = \frac{z+1}{2}$$



$$\vec{S}(2, 1, 2)$$

$$Q(4, 7, -1)$$

$$\|\vec{QP} \times \vec{S}\| = A = d \cdot \|\vec{S}\|$$

$$d = \frac{\|\vec{QP} \times \vec{S}\|}{\|\vec{S}\|}$$

$$\vec{QP} = (0-4, 2-7, 3-(-1)) = (-4, -5, 4)$$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & 2 \\ -4 & -5 & 4 \end{vmatrix} = i(4 - (-5) \cdot 2) -$$

$$-j(8 - (-4) \cdot 2) +$$

$$+ \hat{k}(-5 \cdot 2 - (-4) \cdot 1) =$$

$$= 14i - 16j - 6k$$

$$d = \frac{\sqrt{14^2 + 16^2 + 6^2}}{\sqrt{4 + 1 + 4}} \dots$$

$$x + y + z = 3$$

P-?

$$x + y + z - 3 = 0$$

$$d = \frac{|-3|}{\sqrt{3}} = \sqrt{3} \quad \bar{n} (1, 1, 1)$$

distance.

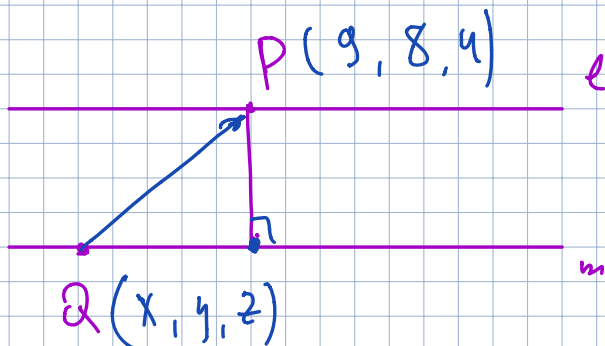
$$\|\bar{n}\| = \sqrt{3}$$

Distance b/w 2 lines.

$$l: x-9 = y-8 = z-4$$

$$m: x-10 = y-10 = z-7 = t$$

$$\vec{d} = (1, 1, 1)$$



$$\begin{cases} x = t + 10 \\ y = t + 10 \\ z = t + 7 \end{cases}$$

$$\underline{\underline{\vec{QP}}} = (9 - t - 10, 8 - t - 10, 4 - t - 7)$$

$$\vec{d} = (1, 1, 1)$$

$$(-t-1) + (-t)-2 + (-t)-3 = 0$$

$$-3t = 6$$

$$t = -2$$

Break, 5 min.

Given eq. of Line:

$$\frac{x-2}{2} = \frac{y-3}{3} = \frac{z-12}{5}$$

$P(4, a, b)$ - is on the Line

$a \neq b = ?$

$$a + b = 23$$

Part 2. Grand competition

Go to <http://b.socrative.com>
Type Room: **LINAL**
Online students pick **BLUE** color,
Offline students pick **MAGENTA** color.

Useful links

- <https://www.geogebra.org>
- https://youtu.be/fNk_zzaMoSs
- <http://immersivemath.com/ila>
<http://brilliant.org>