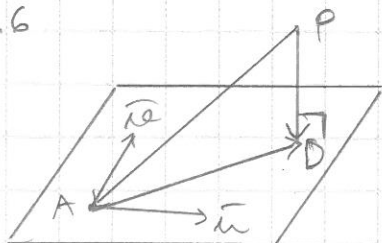


11.6



$$A = (4, 3, -5), \quad P = (3, -13, -2)$$

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

$$\begin{aligned} \vec{PD} &= \vec{PA} + \vec{AD} = \vec{PA} + s\vec{u} + t\vec{v} \\ &= (\vec{i} + 16\vec{j} - 3\vec{k}) + s(-2\vec{i} - \vec{j} + \vec{k}) + t(\vec{i} + 2\vec{j} - 3\vec{k}) \\ &= (1 - 2s + t)\vec{i} + (16 - s + 2t)\vec{j} + (-3 + s - 3t)\vec{k} \end{aligned}$$

$$\begin{cases} \vec{u} \perp \vec{PD} \Leftrightarrow \vec{u} \cdot \vec{PD} = -2 \cdot (1 - 2s + t) + (-1) \cdot (16 - s + 2t) + 1 \cdot (-3 + s - 3t) = 0 \\ \vec{v} \perp \vec{PD} \Leftrightarrow \vec{v} \cdot \vec{PD} = 1 \cdot (1 - 2s + t) + 2 \cdot (16 - s + 2t) - 3 \cdot (-3 + s - 3t) = 0 \end{cases}$$

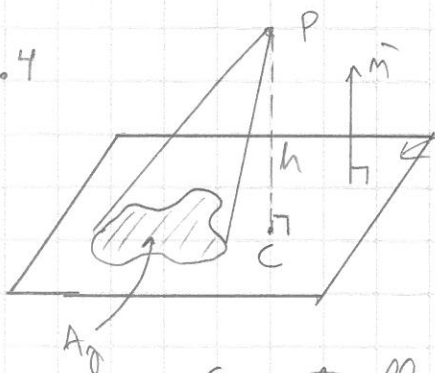
$$\Leftrightarrow \begin{cases} 6s - 7t - 21 = 0 \\ -7s + 14t + 42 = 0 \end{cases}$$

$$\Rightarrow s = 0, t = -3$$

$$\Rightarrow \vec{PD} = -2\vec{i} + 10\vec{j} + 6\vec{k}$$

$$\Rightarrow D = (3 - 2, -13 + 10, -2 + 6) = \underline{(1, -3, 4)}$$

11.4



$$x - y + 3z + 10 = 0$$

$$P = (2, -1, 3)$$

$$\vec{m} = \vec{i} - \vec{j} + 3\vec{k}$$

$$\vec{PC} \parallel \vec{m} \Leftrightarrow \vec{PC} = t\vec{m} = t\vec{i} - t\vec{j} + 3t\vec{k}$$

$$\Rightarrow C = (2 + t, -1 - t, 3 + 3t)$$

$$C \text{ on the plane} \Leftrightarrow (2 + t) - (-1 - t) + 3(3 + 3t) + 10 = 0$$

$$\Leftrightarrow 11t + 22 = 0 \Leftrightarrow t = -2$$

$$\Rightarrow \vec{PC} = -2\vec{i} + 2\vec{j} - 6\vec{k}$$

$$h = |\vec{PC}| = \sqrt{(-2)^2 + 2^2 + (-6)^2} = \sqrt{44} = \sqrt{4 \cdot 11} = 2\sqrt{11}$$

$$\text{Kantian tilavuus: } V = \frac{1}{3} A_0 h = \frac{1}{3} \cdot 6\sqrt{11} \cdot 2\sqrt{11} = 4 \cdot 11 = \underline{44}$$

$$|TA|: \text{ taso: } x - y + 3z + 10 = 0$$

lasketaan 3 tason pistettä

$$y = z = 0: \quad x + 10 = 0 \Leftrightarrow x = -10 \Rightarrow A = (-10, 0, 0)$$

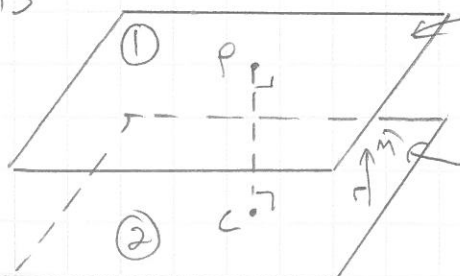
$$x = z = 0: \quad -y + 10 = 0 \Leftrightarrow y = 10 \Rightarrow B = (0, 10, 0)$$

$$z = 1, x = 0: \quad -y + 3 + 10 = 0 \Leftrightarrow y = 13 \Rightarrow C = (0, 13, 1)$$

$$\vec{AB} = \dots \quad \vec{AC} = \dots$$

$$\vec{PD} = \vec{PA} + s\vec{AB} + t\vec{AC} = \dots$$

11.13



$$2x + y - 5z - 1 = 0$$

$$\text{Ollaan } x = z = 0 \Rightarrow$$

$$y - 1 = 0 \Rightarrow y = 1$$

$$\Rightarrow P = (0, 1, 0) \text{ on tasolla 1}$$

$$2x + y - 5z + 71 = 0$$

$$\vec{m} = 2\vec{i} + \vec{j} - 5\vec{k}$$