1.

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

$$(x,y) \in [-5,5]^2$$

$$P = (1,2,13) \qquad \vec{s}(u,v) = \begin{bmatrix} u \\ v \\ u^3 + (u-2)^2 + (v+1)^3 - (v+2)^2 \end{bmatrix}$$

$$\vec{s}_u(u,v) = \frac{\partial \vec{s}(u,v)}{\partial u} = \begin{bmatrix} 1 \\ 0 \\ 3u^2 + 2(u-2) \end{bmatrix}$$

$$\vec{s}_v(u,v) = \frac{\partial \vec{s}(u,v)}{\partial v} = \begin{bmatrix} 0 \\ 1 \\ 3(v+1)^2 - 2(v+2) \end{bmatrix}$$

$$\vec{n} = \vec{s}_u(u,v) \times \vec{s}_v(u,v) = \vec{s}_u(1,2) \times \vec{s}_v(1,2) =$$

$$= \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \times \begin{bmatrix} 0 \\ 1 \\ 19 \end{bmatrix} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 0 & 1 \\ 0 & 1 & 19 \end{vmatrix} =$$

$$= \vec{i}(0-1) - \vec{j}(19-0) + \vec{k}(1-0) \Rightarrow \vec{n} = \begin{bmatrix} -1 \\ -19 \\ 1 \end{bmatrix}$$

érintő sík $\quad \vec{n}(\vec{p}_0 - \vec{p}) = \begin{bmatrix} -1 \\ -19 \\ 1 \end{bmatrix} \cdot \left(\begin{bmatrix} 1 \\ 2 \\ 13 \end{bmatrix} - \vec{p} \right)$

$$0 = -(1-x) - 19(2-y) + 13 - z$$