

Quiz 4

$$z = f = x^3 + 3x^2 + y^3 - 3y$$

$$1. \nabla F = (3x^2 + 6x, 3y^2 - 3) = \langle 0, 0 \rangle$$
$$3x(x+2) \quad 3(y-1)(y+1)$$

$\begin{matrix} \text{"} \\ \text{"} \\ 0 \end{matrix}$ $\begin{matrix} \text{"} \\ \text{"} \\ 0 \end{matrix}$

\Rightarrow critical pts $(0, 1), (0, -1), (-2, 1), (-2, -1)$

$$2. f_{xx} = 6x + 6, \quad f_{xy} = 0, \quad f_{yy} = 6y$$

$$d = \det \begin{pmatrix} 6x+6 & 0 \\ 0 & 6y \end{pmatrix}$$

$$\boxed{(0, 1)} \quad d = 36 > 0, \quad f_{xx} = 6 > 0, \quad \underline{\text{local min}}$$

$$\boxed{(0, -1)} \quad d = -36 < 0, \quad \underline{\text{saddle}}$$

$$\boxed{(-2, 1)} \quad d = -36 < 0, \quad \underline{\text{saddle}}$$

$$\boxed{(-2, -1)} \quad d = 36 > 0, \quad f_{xx} = -6 < 0, \quad \underline{\text{local max}}$$