d) $f(z) = z^3 - 1 = (x+iy)^3 - 1 = (x+iy)(x+iy)(x+iy) - 1 = x^3 + 3x^2 iy + 3x(iy)^2 + (iy)^3 - 1 =$

$= x^3 + 3x^2 iy - 3xy^2 - iy^3 - 1 \therefore f(z) = x^3 + 3x^2 yi - 3xy^2 - iy^3 - 1 = (x^3 - 3xy^2 - 1) + (3x^2 y - y^3)i$

$$\boxed{f(z) = (x^3 - 3xy^2 - 1) + i(3x^2 y - y^3)}$$

e) $J = \begin{pmatrix} \frac{\partial f_1}{\partial x} & \frac{\partial f_1}{\partial y} \\ \frac{\partial f_2}{\partial x} & \frac{\partial f_2}{\partial y} \end{pmatrix} \therefore \boxed{J = \begin{pmatrix} 3x^2 - 3y^2 & -6xy \\ 6xy & 3x^2 - 3y^2 \end{pmatrix}}$; $f_1 = \mathrm{Re}(f(z))$, $f_2 = \mathrm{Im}(f(z))$

* $\frac{\partial f_1}{\partial x} = \frac{\partial}{\partial x}(x^3 - 3xy^2 - 1) = 3x^2 - 3y^2$
* $\frac{\partial f_2}{\partial x} = \frac{\partial}{\partial x}(3x^2 y - y^3) = 6xy$
* $\frac{\partial f_1}{\partial y} = \frac{\partial}{\partial y}(x^3 - 3xy^2 - 1) = -6xy$
* $\frac{\partial f_2}{\partial y} = \frac{\partial}{\partial y}(3x^2 y - y^3) = 3x^2 - 3y^2$