1) $3y = z^3 + 3xz$

a) $\frac{\partial}{\partial x} \Rightarrow 0 = 3z^2 \cdot \frac{\partial}{\partial x} z(x,y) + 3\left(z + x \cdot \frac{\partial}{\partial x} z(x,y)\right)$

$\Leftrightarrow -z = \frac{\partial}{\partial x} z(x,y) \cdot (z^2 + x)$

$\Leftrightarrow \frac{-z}{z^2+x}$

$\frac{\partial}{\partial y} \Rightarrow 3 = 3z^2 \cdot \frac{\partial}{\partial y} z + 3x \cdot \frac{\partial}{\partial y} z$

$\Leftrightarrow \frac{1}{z^2+x} = \frac{\partial}{\partial y} z(x,y)$

b) $\frac{\partial}{\partial y^2} z^2 = \frac{\partial}{\partial y}\left(z^2+x\right)^{-1} = -\frac{\left(2z \cdot \frac{\partial}{\partial y} z\right)}{(z^2+x)^2} = \frac{-2z}{(z^2+x)^3}$

$\frac{\partial z^2}{\partial x^2} = \frac{\partial}{\partial x} \cdot \left(\frac{-z}{z^2+x}\right) =$

$= \frac{\frac{-z}{z^2+x} \cdot (z^2+1) - z \cdot \left(2z \frac{\partial}{\partial x} z + 1\right)}{(z^2+x)^2} = \frac{-z + \frac{2z^3}{z^2+x} - z}{(z^2+x)^2}$

$= \frac{z^3 + zx - 2z^3 + z^3 + 2x}{(z^2+x)^3} = \frac{2x}{(z^2+x)^3}$

$\frac{\partial^2 z}{\partial y^2} - \frac{\partial^2 z}{\partial x^2} = 0$