b) $\vec{\nabla} f(x,y) = \left(\dfrac{y}{x}, \ln(x) + 2y \right)$

$\vec{\nabla} f(1,2) = (2,4)$

c) $\vec{u} = \left(\cos \dfrac{\pi}{3}, \sin \dfrac{\pi}{3} \right) = \left(\dfrac{1}{2}, \dfrac{\sqrt{3}}{2} \right)$

$D_{\vec{u}} f(1,2) = 2 \cdot \left(\dfrac{1}{2} \right) + \dfrac{4\sqrt{3}}{2}$

$D_{\vec{u}} f(1,2) = 1 + 2\sqrt{3}$

$\vec{\nabla} f(1,2) = (2,4)$

$\| \vec{\nabla} f(1,2) \| = \sqrt{2^2 + 4^2} = \sqrt{20} = 2\sqrt{5}$

$2\sqrt{5} = $ valor da taxa máxima de crescimento.

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

$\vec{\nabla} f(x,y) = (2x, 4y)$

$\vec{\nabla} f(1,2) = (2,8)$

$(2,8) \cdot (x-1, y-2) = 0$

$2x - 2 + 8y - 16 = 0$

$2x + 8y = 18$

Reta tangente à curva de nível $f(x,y) = 9$

$x + 4y = 9$