b) $z = \sqrt{xy}$ $\quad P_0(2,2,2)$ $\quad \alpha = \frac{2}{3}\pi$

$$z_x = \frac{1}{2}(xy)^{-\frac{1}{2}} \cdot y$$

$$z_y = \frac{1}{2}(xy)^{-\frac{1}{2}} \cdot x$$

$$\frac{\partial z}{\partial \vec{a}} = z_x \cdot \cos\alpha + z_y \cdot \sin\alpha$$

$$= \frac{y \cdot \cos\alpha + x \sin\alpha}{2\sqrt{xy}}$$

$$= \frac{2 \cdot \cos\left(\frac{2}{3}\pi\right) + 2 \cdot \sin\left(\frac{2}{3}\pi\right)}{2 \cdot \sqrt{2 \cdot 2}}$$

$$= \frac{2 \cdot \left(-\frac{1}{2}\right) + 2 \cdot \frac{\sqrt{3}}{2}}{2 \cdot 2}$$

$$= \frac{\sqrt{3} - 1}{4}$$