Term Test Bb version 2

(1) [5 points] Linearize the following function around $x = \pi, y = 2$.

$$f\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} y\cos(xy) \\ 2x^2 + y^2 \end{bmatrix} \tag{1}$$

(2) [5 points] There is a linear relationship between the latitude of the centre of a US state and that state's skin cancer mortality rate (deaths per ten million in one year). Ideally, you would use the data from all fifty states, but that's a large matrix and impractical for a term test. Find the best estimate for a linear regression line from the following data:

State	Alabama	California
Skin Cancer Mortality Rate	219	182
Centre Latitude	33.0	37.5

(3) [5 points] Find the distance between the point $T = (7, -2, 12)$ and the plane containing $P = (8, -8, -1), Q = (1, -1, -1), R = (8, -22, 11)$. (Hint: find the displacement vectors $\vec{PT}, \vec{PQ}, \vec{PR}$ and project $\vec{PT}$ onto the plane spanned by $\vec{PQ}$ and $\vec{PR}$; then find the difference between $\vec{PT}$ and its projection.)