Term Test Bb version 1

(1) [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	Nebraska	Wisconsin
Skin Cancer Mortality Rate	219	182	122	110
Centre Latitude	33.0	37.5	41.5	44.5

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

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

(3) [5 points] Find the distance between the point $T = (2, 7, 5)$ and the plane containing $P = (5, 3, -6), Q = (5, 10, -10), R = (-9, -11, 10)$. (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.)