Problem-1

Given that,

$$f(z) = \log_e(1+z)$$

where $z = x^T x$, $x \in R^d$

Here,

$$\frac{d}{dx}(f(z)) = \frac{d}{dx}\left(\log_e(1+z)\right)$$

$$= \frac{1}{1+x^T x} \frac{d}{dx}(1+x^T x)$$

$$= \frac{2x^T}{1+x^T x}.$$