Name:

1. Let a and b be vectors in $\mathbb{R}^n$. Carefully show that

$$(a + b)^T (a - b) = \|a\|^2 - \|b\|^2$$

2. Let v and b be vectors in $\mathbb{R}^n$. Find the value of the number α that minimizes the norm squared

$$\|\alpha v - b\|^2.$$

(BTW: by solving this you are answering the following question: what multiple of v is closest to b?)

3. Let x and y be boolean feature vectors (entries are 0 or 1) of symptoms exhibited by patients X and Y respectively. It turns out that $x^T y = 3$. What does this fact mean in everyday language?