"Orientation" of vectors to project and to project on to.

Q1. Suppose you are given a matrix B and data matrix X

$$B = \begin{bmatrix} — & b_1^T & — \\ & \vdots & \\ — & b_k^T & — \end{bmatrix} \qquad X = \begin{bmatrix} — & x_1^T & — \\ & \vdots & \\ — & x_n^T & — \end{bmatrix}$$

and you want a vector y_t:  where $y_t[j]$ = projection of x_t on b_j

(a) take t^{th} row of BX^T (and transpose it if you want "tall" vectors y_t)

(b) take t^{th} row of XB^T (")

(c) take the t^{th} column of BX^T

(d) take the t^{th} column of XB^T

(e) two of the above are correct [and you know which ones]
exactly

Q2: Suppose you are given a matrix $C = [c_1 \; c_2 \; \dots \; c_k]$ ($d \times k$) and data matrix $X = \begin{bmatrix} -x_1^T- \\ \vdots \\ -x_n^T- \end{bmatrix}$ ($n \times d$)

and you want a vector y_t where $y_t[j]$ = projection of x_t on c_j.

(a) take the t^{th} row of $C^T X^T$ (and transpose to get a "tall" y_t)

(b) take the t^{th} row of XC (")

(c) take the t^{th} column of $C^T X^T$

(d) take the t^{th} column of XC

(e) exactly two of the above are correct [and you know which ones]