(3A) To express $(\tilde{u}^T\tilde{x})(\tilde{v}.\tilde{x})(\tilde{w}^T.\tilde{x})$.

$$\tilde{u}^T\tilde{x} = \sum_{i=1}^{n} u_i x_i$$

$$\tilde{v}^T\tilde{x} = \sum_{j=1}^{n} v_j x_j$$

$$\tilde{w}^T\tilde{x} = \sum_{k=1}^{n} w_k x_k$$

$$(\tilde{u}^T\tilde{x})(\tilde{v}.\tilde{x})(\tilde{w}.\tilde{x}) = \left(\sum_{i=1}^{n} u_i x_i\right).\left(\sum_{j=1}^{n} v_j x_j\right).\left(\sum_{k=1}^{n} w_k x_k\right)$$

$$= \sum_{i=1}^{n}\sum_{j=1}^{n}\sum_{k=1}^{n} u_i v_j w_k (x_i x_j x_k)$$

$$= \sum_{i=1}^{n}\sum_{j=1}^{n}\sum_{k=1}^{n} w_{ijk}\, \phi_{ijk}(x)$$

where $w_{ijk} = u_i v_j w_k$. $\phi_{ijk}(x) = x_i x_j x_k$.

$$= w^T \phi(\tilde{x})$$

$$w = [w_{ijk}] = [u_1 v_1 w_1, u_1 v_1 w_2 \ldots u_n v_n w_n]^T$$

$$\phi_{ijk}(\tilde{x}) = [x_1 x_1 x_1, x_1 x_1 x_2, \ldots x_n x_n x_n]$$