Step-1

Given that if A has independent columns, and then A^TA is square and symmetric and invertible.

So,

$$x^TA^TAx=(Ax)^T(Ax)$$
$$=\text{length squared}$$

So, $x^TA^TAx=0$ only if $Ax=0$

Step-2

Given that A have independent columns

So, $Ax=0$ only when $x=0$

Therefore, A^TA is positive definite.