Problem

a) Let $x_0, ..., x_{n-1}$ and M be positive real numbers. Find real numbers $a_0, ..., a_n$ so that $\sum_{i=0}^{n-1} x_i a_i$ is maximized subject to the constraint that $\sum_{i=0}^{n-1} a_i^2 = M$
b) If you used the definition of the cosine between vectors as part of your solution in a), prove independently that your solutiion is correct (the definition depends on the result being established here).