3.26 u fixed vector

$$\max_{x \in \{0,1\}^n} \; x^T u u^T (1-x)$$

$$= (x^T u)\,(u^T(1-x))$$

$$= \left(\sum_i (x_i u_i)\right) \cdot \left(\sum u_j - \sum_i x_i u_i \right)$$

Since u is a fixed vector, and $\sum u_j = M \Rightarrow$ fixed number.

Let $\sum_i x_i u_i = \sigma$ $\rightarrow$ note that this is equivalent to selecting some set of entries in u & summing them up.

$\therefore$

$\therefore$ $\max \; \sigma \cdot (M - \sigma)$

This is a quadratic in σ, and is maximized at $\sigma = M/2$.

$\therefore$ This optimization problem is partitioning u into 2 sets such that both ~~area~~ sum of both are as equal as possible. [Formally, the $\max \sigma (M-\sigma)$ is a concave function, with max at $\sigma = M/2$]