Solution to first part of the Problem 5

I keep the notations as in the official solution Fig.1. (so please refer to that Fig.1). Considering points in the co-ordinate plane

We have $T = m_1P + m_2Q,\ S = n_1A + n_2B, where\ , m_{1,}m_2, n_{1,}n_2$ are positive reals such that $m_1 + m_2 = n_1 + n_2 = 1,$

Now $$|S - T| = |(n_1A + n_2B) - (m_1P + m_2Q)|$$

$$= |(n_1A + n_2B)(m_1 + m_2) - (m_1P + m_2Q)(n_1 + n_2)|$$

$$= |n_1m_1(A - P) + n_1m_2(A - Q) + n_2m_1(B - P) + n_2m_2(B - Q)|$$

$$\leq n_1m_1|A - P| + n_1m_2|A - Q| + n_2m_1|B - P| + n_2m_2|B - Q|$$

$$\leq n_1m_1 + n_1m_2 + n_2m_1 + n_2m_{2=} = 1$$