1.) $\nabla_w u(w) = \nabla_w \left[w^T (m_1 - m_2) + \lambda (1 - \|w\|^2) \right]$

$= m_1 - m_2 - 2\lambda \|w\|$

$0 = m_1 - m_2 - 2\lambda (1)$

$2\lambda = m_1 - m_2$

$\lambda = \frac{m_1 - m_2}{2}$