6.

$$\epsilon = \frac{1}{2}(y_i - m_1 x_i^2 - m_1 x_i - c)^2$$

$$\frac{\partial \epsilon}{\partial m_1} = -x_i^2(y_i - m_1 x_i^2 - m_2 x_i - c) \qquad \frac{\partial \epsilon}{\partial c} = -(y_i - m_1 x_i^2 - m_2 x_i - c)$$

$$\frac{\partial \epsilon}{\partial m_2} = -x_i(y_i - m_1 x_1^2 - m_2 x_i - c)$$

$m_1 = 10$, $m_2 = 5$, $c = 12$, eeta $= 0.001$, epochs $= 1$

$$\nabla m_1 = -x_1^2(y_1 - m_1 x_1^2 - m_2 x_1 - c)$$
$$= -7.6^2(157 - 10(7.6)^2 - 5(7.6) - 12)$$
$$= 57.76(150.12) \Rightarrow 27181.856$$

$$\nabla m_2 = -x_1(y_1 - m_1 x_1^2 - m_2 x_1 - c)$$
$$= -7.6(157 - 10(7.6)^2 - 5(7.6) - 12)$$
$$= 3576.56$$

$$\nabla c = -(y_1 - m_1 x_1^2 - m_2 x_2 - c) \Rightarrow -(157 - 10(7.6)^2 - 5(76) - 12)$$
$$= 812.6$$

$$m_1 = m_1 - \eta \times \nabla m_1 = 10 - 0.001 \times 27181.85 = -17.18185$$
$$m_2 = m_2 - \eta \times \nabla m_2 = 5 - 0.001 \times 3576.56 = -1.423564$$
$$c = c - \eta \times \nabla c = 12 - 0.001 \times 812.6 = 11.1874$$

Sample 2: $\nabla m_1 = -x_2^2(y_2 - m_1 x_2^2 - m_2 x_2 - c)$

$$= -7.1^2(174 + 17.181(7.1)^2 + 1.423(7.1) - 11.1874)$$
$$= -52341.8814$$

$$\nabla m_2 = -x_2(y_2 - m_1 x_2^2 - m_2 x_2 - c)$$
$$= -7.1(174 + 17.181(7.1)^2 + 1.423(7.1) - 11.1874)$$
$$= -7376.971$$

$$\nabla c = -(y_2 - m_1 x_2^2 - m_2 x_2 - c)$$
$$= -(174 + 17.181(7.1)^2 + 1.423(7.1) - 11.187)$$
$$= -1039.01051$$

$$m_1 = m_1 - \eta \times \nabla m_1 = -17.18 - 0.001 \times -52341 = 899.213$$
$$m_2 = m_2 - \eta \times \nabla m_2 = -1.42 - 0.001 \times -7376 = 5.956$$
$$c = c - \eta \times \nabla c = 11.18 - 0.001 \times -1039 = 12.219$$