

$$h'(\alpha) = \phi'(x_k + \alpha r_k) \cdot (x_k + \alpha r_k)$$

$$0 = \phi'(x_k + \alpha r_k) \cdot (x_k + \alpha r_k)$$

$$\int (x_k + \alpha r_k) = 0$$

$$x_k \alpha + \frac{\alpha^2 r_k}{2} = 0$$

$$\alpha \left(x_k + \frac{\alpha r_k}{2} \right) = 0$$

$$\frac{x_k + \alpha r_k}{2} = 0$$

$$\alpha r_k = -x_k$$

$$\alpha = -\frac{x_k}{r_k}$$