$$\alpha_r k = -\chi_k$$

$$k = -\frac{\chi_k}{r_k}$$

$$h'(\alpha) = \nabla \Phi (x^k + \alpha r_k)^T r^k = (A(x^k + \alpha_r r^k) + b)^T r^k$$

$$= \nabla \Phi (x^k)^T r^k + \alpha (r^k) A r^k = 0$$

$$\alpha = -\frac{\nabla \Phi (x^k)^T r^k}{r^k A r^k}$$

$$r_k = -\nabla (\Phi(x_k))^T$$

$$\alpha = -\frac{(r^k)^T r^k}{r^k A r^k}$$