

**2023-03-13**

Suppose  $A = M - N$  is a splitting and consider the stationary iteration  $Mx_{k+1} = Nx_k + b$ . Show that if  $x_0 = 0$  then

$$x_k = \sum_{j=0}^k R^j M^{-1}b$$

where  $R = M^{-1}N$ . Note: we can compute the partial sum in closed form as

$$x_k = (I - R)^{-1}(I - R^{k+1})M^{-1}b$$

if  $I - R$  is invertible – but you don't need to prove this.