Q3 $(A^T N^{-1} A) m = A^T N^{-1} d$

$$A = QR$$

$$R^T Q^T N^{-1} Q R m = R^T Q^T N^{-1} d$$

(Since R is a square-matrix) $\Rightarrow$

$$\boxed{Q^T N^{-1} Q R m = Q^T N^{-1} d}$$

when $N = I$

$$\underbrace{Q^T Q}_{I} R m = Q^T N^{-1} d$$

I as Q is orthogonal

$$R m = Q^T N^{-1} d$$

$$m = R^{-1} Q^T d$$

Q4 $\chi^2 = (d - Am)^T N^{-1} (d - Am)$

$$N = V \Lambda V^T \qquad V V^T = I$$

$$N^{-1} = V \Lambda^{-1} V^T$$

$$\chi^2 = (d - Am)^T V \Lambda^{-1} V^T (d - Am)$$

$$\chi^2 = (V^T d - V^T Am)^T \Lambda^{-1} (V^T d - V^T Am)$$

$$\chi^2 = (\Lambda^{-1/2} V^T d - \Lambda^{-1/2} V^T Am)^T \times$$

$$(\Lambda^{-1/2} V^T d - \Lambda^{-1/2} V^T Am)$$

$\tilde{N} = I \Rightarrow$ uncorrelated noise

$\tilde{d} = \Lambda^{-1/2} V^T d \Rightarrow$ uncorrelated data

$d = V \Lambda^{1/2} \tilde{d} \Rightarrow$ correlated data.