PHYS 641
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Assignment 2

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Here we want to find the least squares sol^{n} for the fit parameters when using QR factorization, so $A = QR$

$$\Rightarrow A^T N^{-1} A m = A^T N^{-1} d$$

$$\Rightarrow (QR)^T N^{-1} (QR) m = (QR)^T N^{-1} d$$

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

$$\Rightarrow m = (R^T Q^T N^{-1} Q R)^{-1} R^T Q^T N^{-1} d$$

First assume $N = \mathbb{1}$:

$$\Rightarrow m = (R^T \underbrace{Q^T Q}_{= \mathbb{1} \text{ as } Q \text{ is orthogonal}} R)^{-1} R^T Q^T d$$

$$\Rightarrow m = (R^T R)^{-1} R^T Q^T d$$

$$= R^{-1} \underbrace{(R^T)^{-1} R^T}_{= \mathbb{1}} Q^T d$$

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