① Differential Equations — maximum, minimum

$\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$ (+ve, −ve)

– Gradient.

② PCA Vs SVD

③ SVD, in LR

(Read notes next page)

Using the SVD we can rewrite the variance,

$$\text{Var}[w_{\text{LS}}] = \sigma^2(X^TX)^{-1} = \sigma^2 VS^{-2}V^T.$$

Doubt: not sure maybe collinear?

This inverse becomes huge when S_{ii} is very small for some values of i. (Aside: This happens when columns of X are highly correlated.)

[Read in NMC Effect of correlated predictors (VIF)]

The least squares prediction for new data is

$$y_{\text{new}} = x_{\text{new}}^T w_{\text{LS}} = x_{\text{new}}^T (X^TX)^{-1}X^Ty = x_{\text{new}}^T VS^{-1}U^Ty.$$

When S^{-1} has very large values, this can lead to unstable predictions.

[NMC pdf]

– Variance Inflation Factor