1)

$$g(x) \approx \sum_{i=0}^{n} a_i x^i$$

$$\chi^2 \equiv \int_0^1 \left(g(x) - \sum_{i=0}^{n} a_i x^i\right)^2 dx$$

~~Are we suppose to pick a g(x)?~~

$$\left(g(x) - \sum_{i=0}^{n} a_i x^i\right)^2 = \left(\sum_{i=0}^{n} a_i x^i - g(x)\right)^2$$

Exact form of what was discussed in class

$$\boxed{\chi^2 = \left|\sum_j A_{ij} c_j - y_i\right| = |A\vec{c} - \vec{y}|^2 \qquad \vec{c} = A^+\vec{y} = V\Sigma^+ U^T\vec{y}}$$

Set $\frac{1}{0}$ elements to zero

$$\vec{b} = \vec{x} = \underbrace{V\Sigma^+ U^T}_{A}\vec{g}(x)$$

$$\vec{b} = (A^T A)^{-1} A^T \vec{g}$$

~~let $g(x) = 1 + x + x^2$~~

~~$\Rightarrow a = (1, 1, 1) \quad x^i = (1, x, x^2)$~~

~~(can visually see that)~~

~~$n = 2$~~

~~$\vec{g} = \begin{pmatrix} 1 \\ x \\ x^2 \end{pmatrix}$~~

$A = U \Sigma V^T$