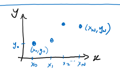
COMP. MATH. L5

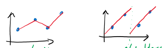
$\cos^2(x) + \sin^2(x) \equiv 1$

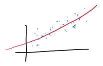


Find $f(\cdot)$ s.t.

$$\boxed{y_i = f(x_i) \quad \forall i = 0, \dots, N}$$

$\Leftrightarrow$ N+1 constraints on $f(\cdot)$.





poly fit

$$p(x) = p_0 x^{deg} + p_1 x^{deg-1} + \dots + p_{deg-1} x^1 + p_{deg} \underbrace{x^0}_{1}$$

degree 'deg' polynomial made up of 'deg' +1 terms.

Equivalently

$$p(x) = \alpha_0 + \alpha_1 x + \alpha_2 x^2 + \dots + \alpha_N x^N$$

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linear / 2 data point example.

Model: $y(x) = a_0 + a_1 x$

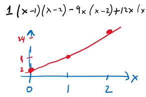
Data. $y_0 = a_0 + a_1 x_0$

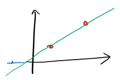
$y_1 = a_0 + a_1 x_1$

Solve for parameters of my model, i.e. a_0, a_1

$$\underbrace{\begin{pmatrix} 1 & x_0 \\ 1 & x_1 \end{pmatrix}}_{V} \begin{pmatrix} a_0 \\ a_1 \end{pmatrix} = \begin{pmatrix} y_0 \\ y_1 \end{pmatrix}$$

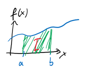
$$L(x) = 1(x-1)(x-2) - 9x(x-2) + 12x(x-1)$$





Quadrature

$$I := \int_a^b f(x)\,dx$$



Anti-derivative / integral.

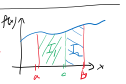
e.g. $\frac{x^2}{2} + c = \int x \, dx$

$\Rightarrow \int_a^b x\,dx = F(b) - F(a)$

$= \frac{b^2}{2} + \cancel{c} - \left(\frac{a^2}{2} + \cancel{c}\right)$

$\therefore$ can ignore constant of integration when doing definite integration.

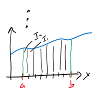
$$I = \int_a^b f(x)\,dx$$



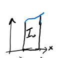
$= I_1 + I_2$

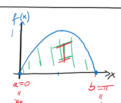
$= \int_a^c f(x)\,dx + \int_c^b f(x)\,dx$

$\vdots$



$$I = \sum_{i=0}^{n} I_i$$



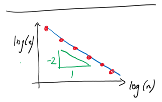


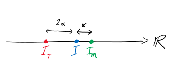
$I = \int_0^\pi \sin(x)\,dx$

$= -\cos(x)\Big|_0^\pi \equiv \Big[-\cos(x)\Big]_0^\pi$

$= -\cos(\pi) - (-\cos(0))$

$= 1 + 1 = 2$





$$I - I_m \approx -2(I - I_T)$$

$\Rightarrow \quad 3I \approx I_m + 2I_T$

$\Rightarrow \quad I \approx \underbrace{\frac{1}{3}(I_m + 2I_T)}_{I_S}$

I_S ↓ more accurate estimate of I.