Lecture 32

1. All terms have degree less than 1

$$f(x,y,z) = c_0 + c_1 x + c_2 y + c_3 z$$

2. All terms that are "linear"

$$f(x,y,z) = c_0 + c_1 x + c_2 y + c_3 z + c_4 xy + c_5 xz + c_6 yz + c_7 xyz$$

Derivative of polynomial Approx.

$$p(x) = \sum_{i=1}^{n} y_i \prod_{j \neq i} \frac{(x - x_j)}{(x_i - x_j)}$$

$$= \sum y_i' \prod_{j \neq i} (x - x_j)$$

$$y_i' = \frac{y_i}{\prod_{j \neq i} (x_i - x_j)}$$

$$p(x) = \sum_{i=1}^{n} y_i \phi_i(x)$$

$$\boxed{p'(x) = \sum_{i=1}^{n} y_i \phi_i'(x)}$$

$$\phi_i(x) = \prod_{j \neq i} (x - x_j)$$

$\phi_i'(x)$ from the product Rule!

$$\phi_1(x) = \underbrace{(x-x_1)}_{f}\underbrace{(x-x_2)(x-x_3)}_{g}$$

$$(fg)'(x) = f'g + fg'$$

$$\phi_1'(x) = (x-x_2)(x-x_3) + (x-x_1)\overset{g'}{\boxed{(x-x_3)}} + (x-x_1)(x-x_2)$$

$$g' = \left[\underbrace{(x-x_2)}_{f}\underbrace{(x-x_3)}_{g}\right]'$$

$$= (x-x_3) + (x-x_2)$$

$$\phi_i'(x) = \sum_{j \neq i} \prod_{\substack{k \neq i \\ k \neq j}} (x - x_k)$$

$$\left(f/g\right)' = \left(f \cdot \frac{1}{g}\right)'$$

$$= f' \frac{1}{g} + f \left(1/g\right)'$$