

### Introducing Taylor Series

Can we get the answer from some basic mathematics.

1. Our aim is
  - a.  $w \Rightarrow w + \eta \Delta w$
  - b.  $\text{Loss}(w) > \text{Loss}(w + \eta \Delta w)$
2. Taylor Series:  $f(x + \Delta x) = f(x) + \frac{\{f'(x)\}}{\{1!\}}\Delta x + \frac{\{f''(x)\}}{\{2!\}}(\Delta x^2) + \frac{\{f'''(x)\}}{\{3!\}}(\Delta x^3) + \dots$
3. Here,  $f(x + \Delta x)$  is  $\text{Loss}(w + \eta \Delta w)$  and  $f(x)$  is  $\text{Loss}(w)$
4. We need to find  $\Delta x$  such that everything after  $f(x)$  sums to a negative value, ie, lowering the overall value of  $f(x + \Delta x)$