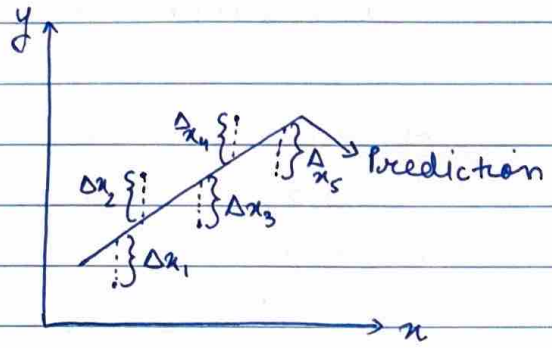
# WEEK - 1

## 1. Gradient Descent




slope intercept

$$y_i = mx_i + c$$

### Error / Cost Function

$$MSE = \frac{1}{n}\sum_{i=1}^{n}\left[y_i - (mx_i + c)\right]^2$$

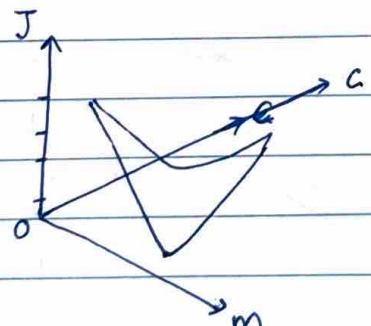
$$J = (y_i - \hat{y})$$

$$J = [y_i = (mx_i + c)]$$

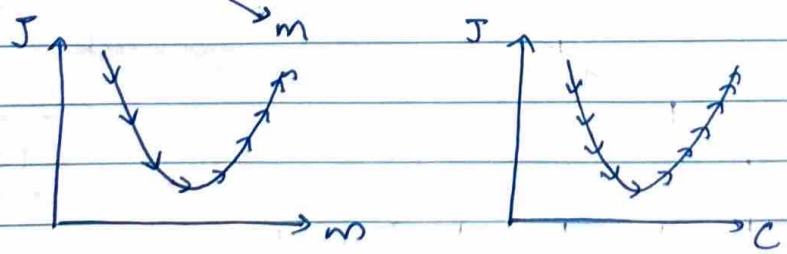
$$J = \sum_{i=1}^{n=5}\left[y_i - (mx_i + c)\right]^2$$

Sum Squared error (SSE)

— x —




$$m = \frac{y_2 - y_1}{x_2 - x_1}$$




learning rate $\lambda$, $\alpha$

Date:

$$J = \frac{1}{n}\sum_{i=1}^{n}\left[y_i - (mx_i + c)\right]^2$$

$$\frac{\partial J}{\partial m} = \frac{2}{n}\sum_{i=1}^{n}(-x_i)\left[y_i - (mx_i + c)\right]$$

$$0 = \sum_{i=1}^{n} -x_i y_i + mx_i^2 + x_i c$$

$$\sum_{i=1}^{n} mx_i^2 + \sum_{i=1}^{n} x_i c = \sum_{i=1}^{n} x_i y_i$$

Diff wrt c, $\frac{\partial J}{\partial c} = \frac{2}{n}\sum_{i=1}^{n} -\left[y_i - (mx_i + c)\right]$

$$0 = \sum_{i=1}^{n} -y_i + mx_i + c$$

$$\boxed{m\sum_{i=1}^{n} x_i + \sum_{i=1}^{n} c = \sum_{i=1}^{n} y_i}$$

$$\boxed{m = m - \lambda\frac{\partial J}{\partial m}}$$

$$\boxed{c = c - \lambda\frac{\partial J}{\partial c}}$$

$x^n \frac{d}{dx}$

$f'(x)$

$f''(x) = \frac{d}{d}(nx) = n$

$f'''(x) = 0$