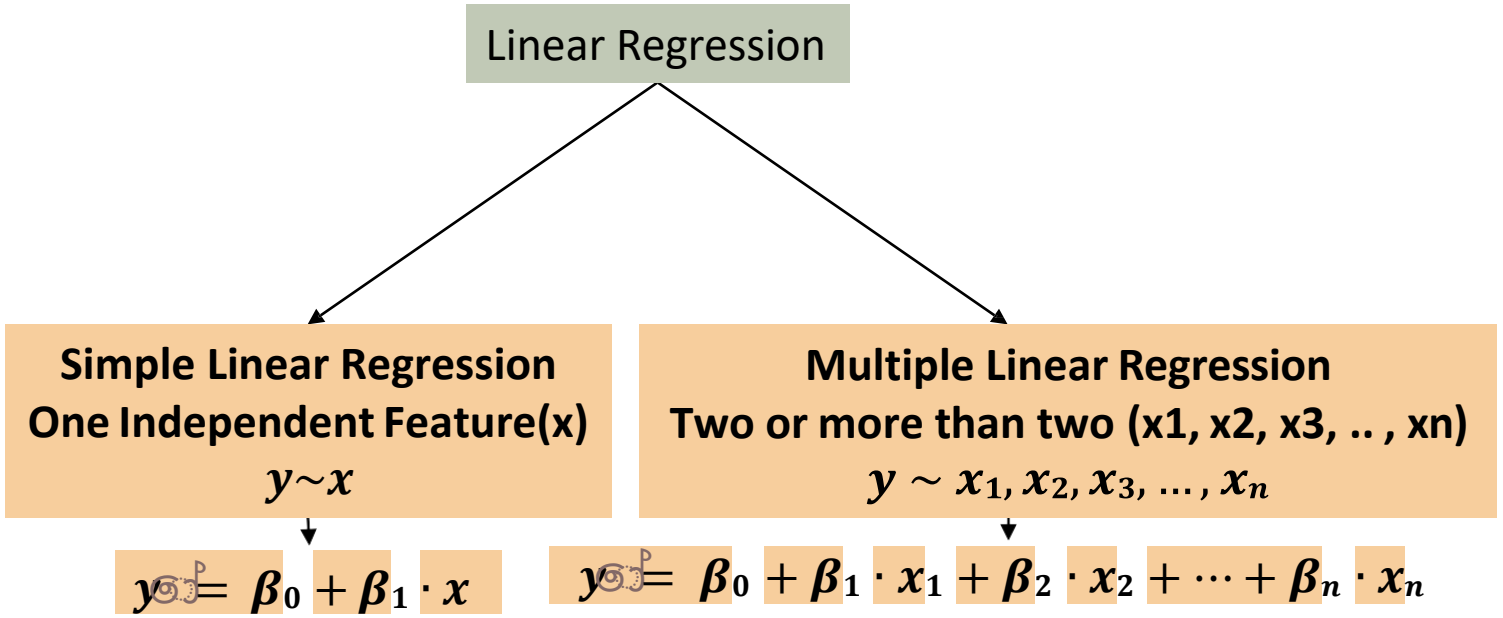
Multiple Linear Regression

What is Multiple linear regression



Example of MLR

Age	Income	Purchase
25	50,000	1,000
30	60,000	2,000
35	70,000	3,000
40	125,000	4,000
45	150,000	5,000

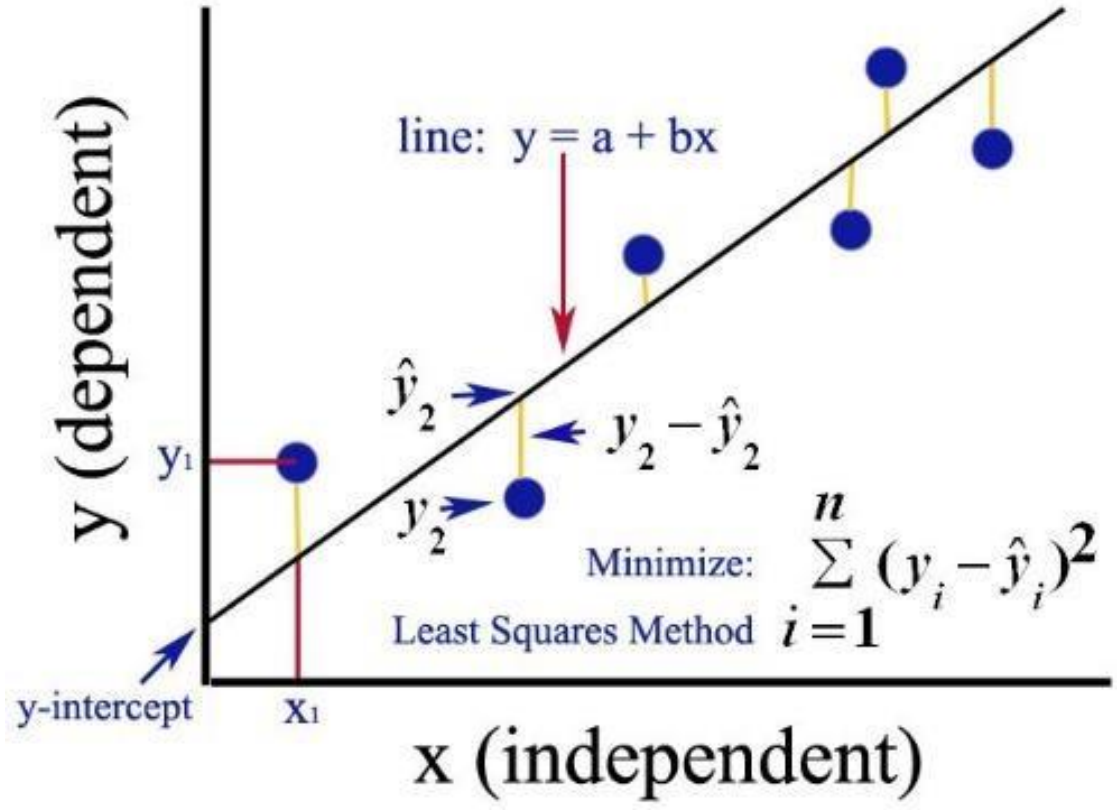
$$Purchase \sim Age, Income$$

$$Purchase\_cap = \beta_0 + \beta_1 \cdot Age + \beta_2 \cdot Income$$

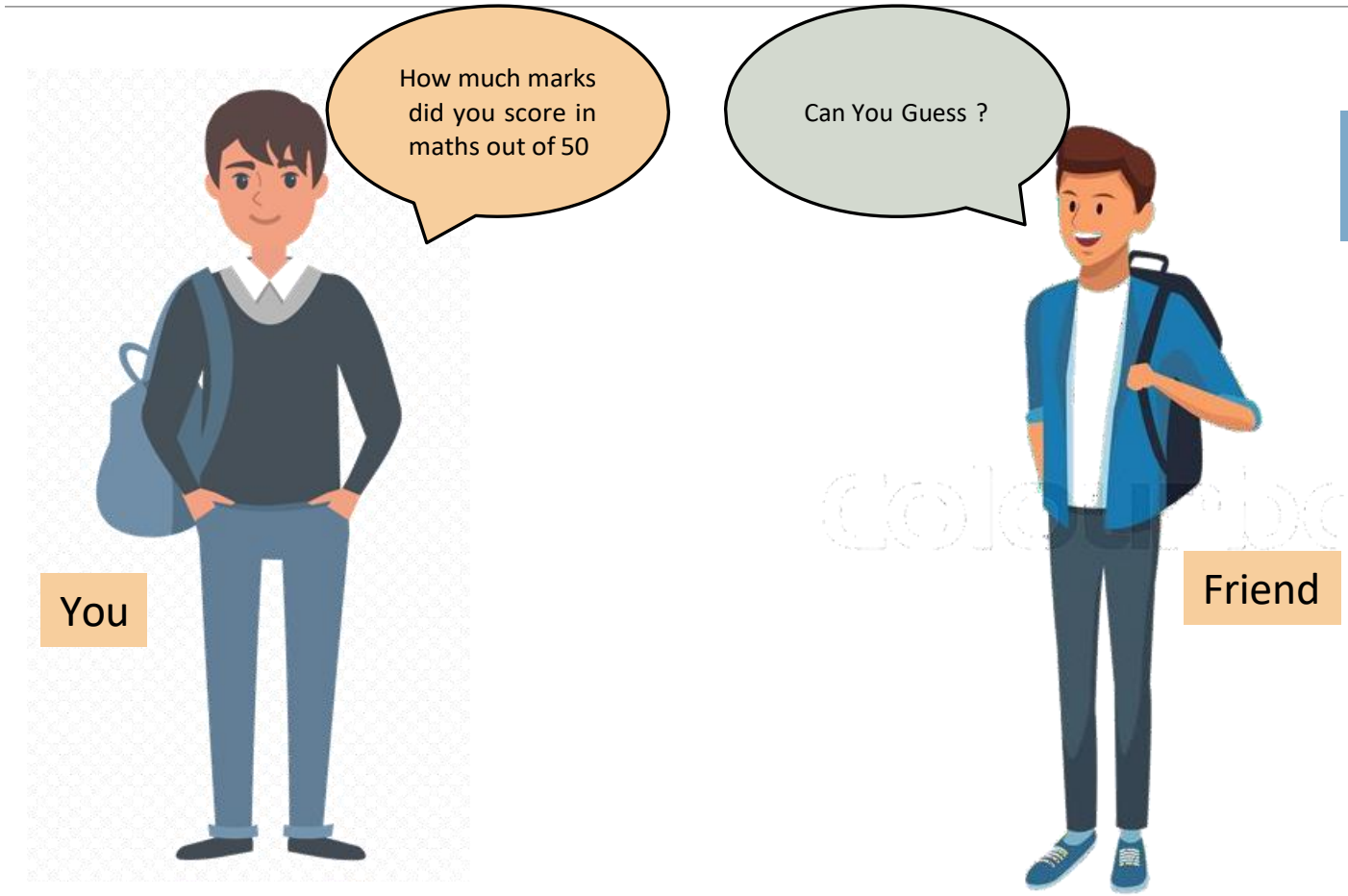
Dependent Variable
(Which is to be predicted)

Cost Function : Mean Squared Error
i.e. Minimize The Squared Error in model
Least Squared Error Model

Least Squared Error model



How are coefficients obtained in MLR? Gradient Descent Algorithm



Prediction 1: 40
Friend Replies : Hey I'm not that intelligent

Prediction 2: 30
Friend Replies : I'm not that dumb

Prediction 3: 35
Friend Replies : You are close

Prediction 4: 34
Friend Replies : You guessed right

Gradient descent algorithm

Random Initial Guess

New Value = Old Value – Step Size

New Value = Old Value – Learning rate*Gradient

Learning rate can be from 0.0001 to 0.2

$$\beta_{k\_new} = \beta_{k\_old} - \alpha \cdot \frac{\partial J}{\partial \beta_k}$$

Where J is cost function or Mean Squared Error in case of Linear Regression

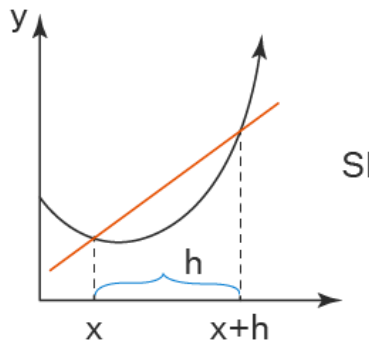
$$J = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2$$

Sum of (Actual – Predicted)^2

What is a derivative?

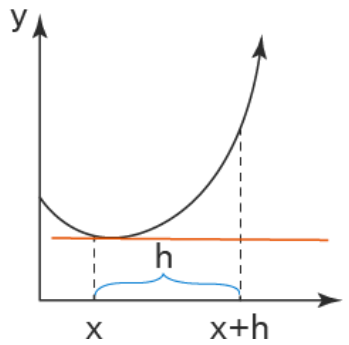
Definition of Derivative

cuemath
THE MATH EXPERT



Slope of Secant = $\frac{f(x+h) - f(x)}{h}$

("Difference quotient")



$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

(if limit exists)

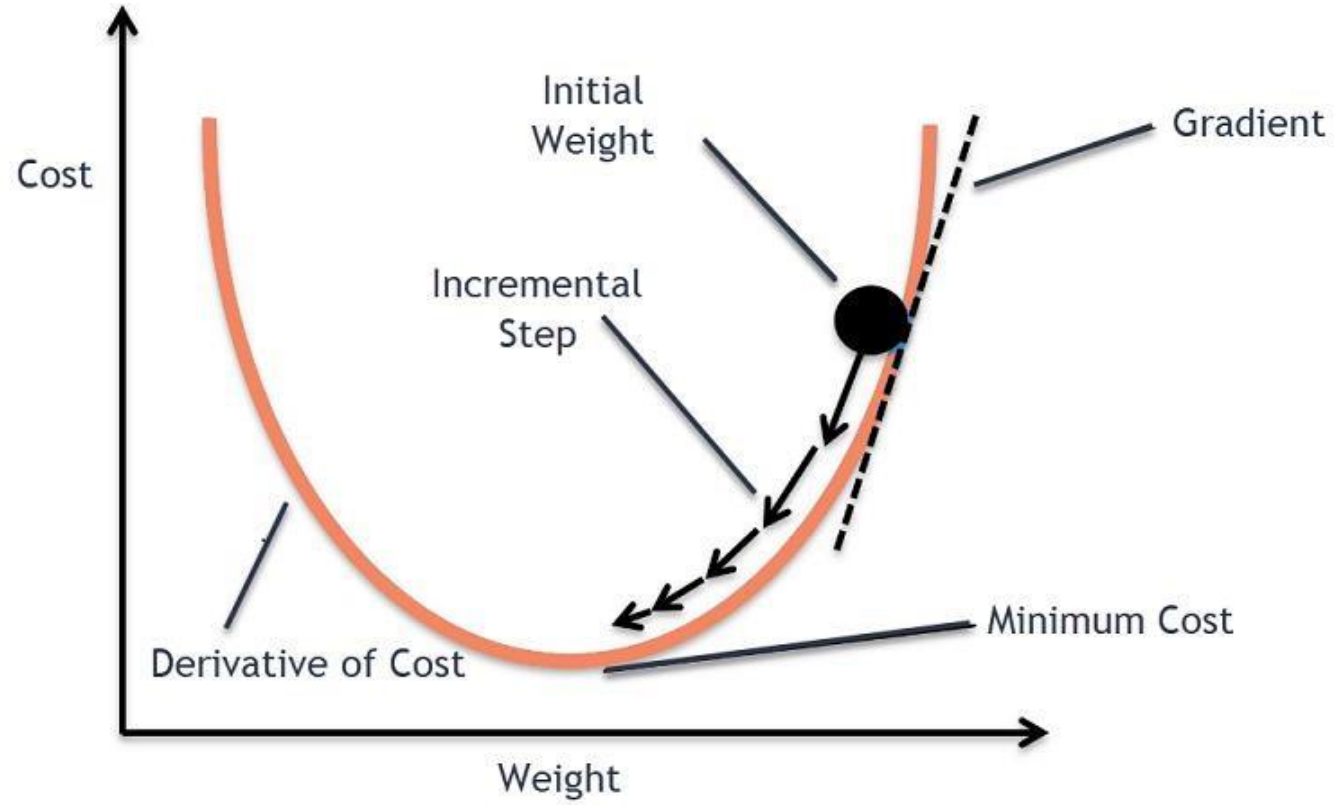
Example
Take a function y = x^2

If x increases by small amount at any point
How much will y increase ?

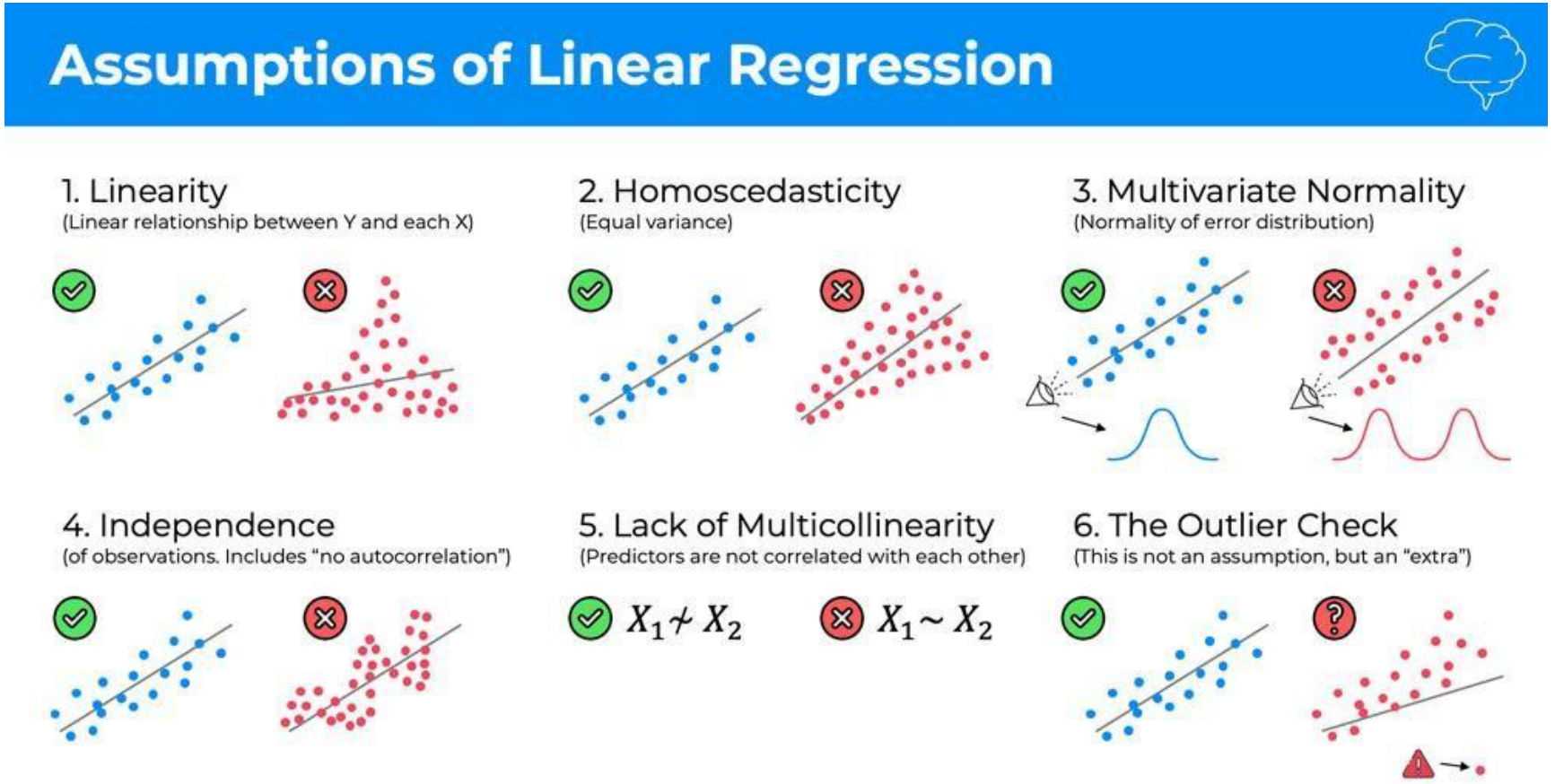
x1 = 2 , x2 = 2.001
y1 = 4 , y2 = 4.004001

$$\frac{dy}{dx} = \frac{y2 - y1}{x2 - x1} = 4.001$$

Gradient Descent working



Assumptions in Linear Regression



Thank you