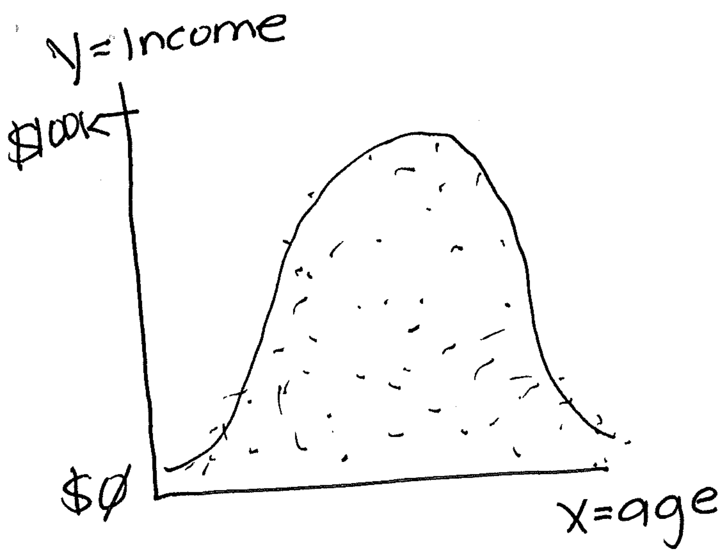
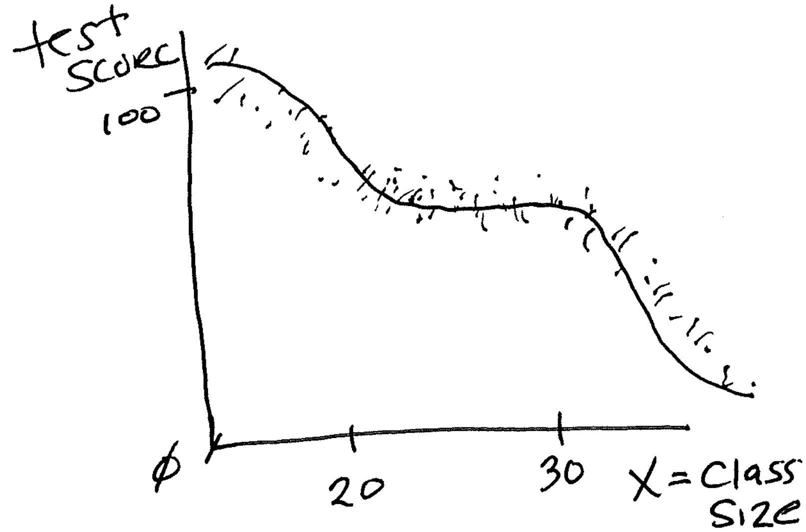
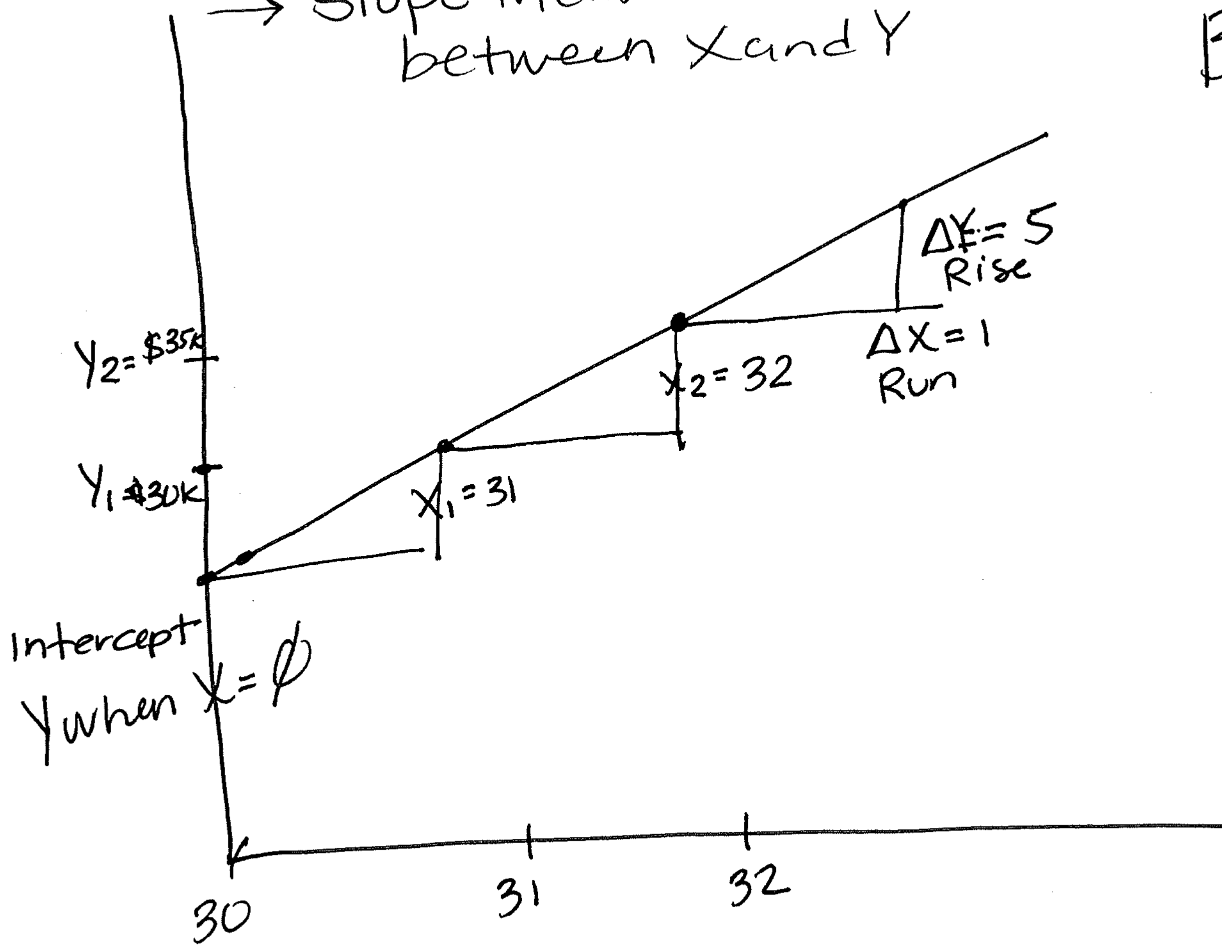




→ Non-linear Relationships

→ Slope Measures relationship between X and Y

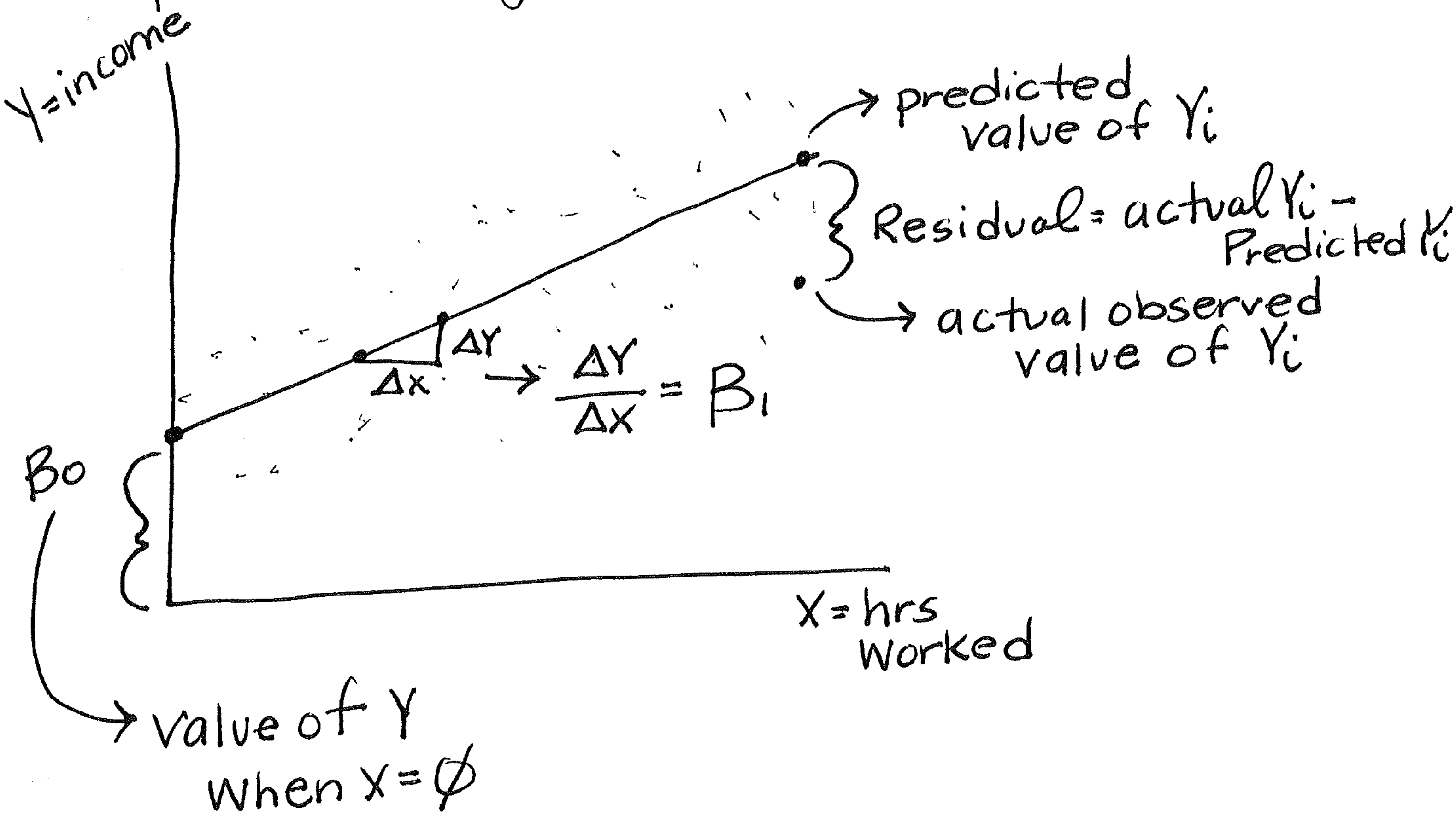


$$B = \frac{\Delta Y}{\Delta X} = \frac{\text{"Rise"}}{\text{"Run"}}$$

$$B = \frac{\overset{Y_2 - Y_1}{35 - 30}}{\underset{X_2 - X_1}{32 - 31}} = \frac{5}{1} = 5$$

Lecture # 4

Population Regression Line



Population Regression Line + Prediction

$$Y_i = B_\phi + B_1 X_i$$

$B_0 = \$5,000$ $B_1 = \$1000$

Ex#3: $X_i = 40$ hours

$E(Y|40) = \$5,000 + \$1,000 * 40 = \$45,000$

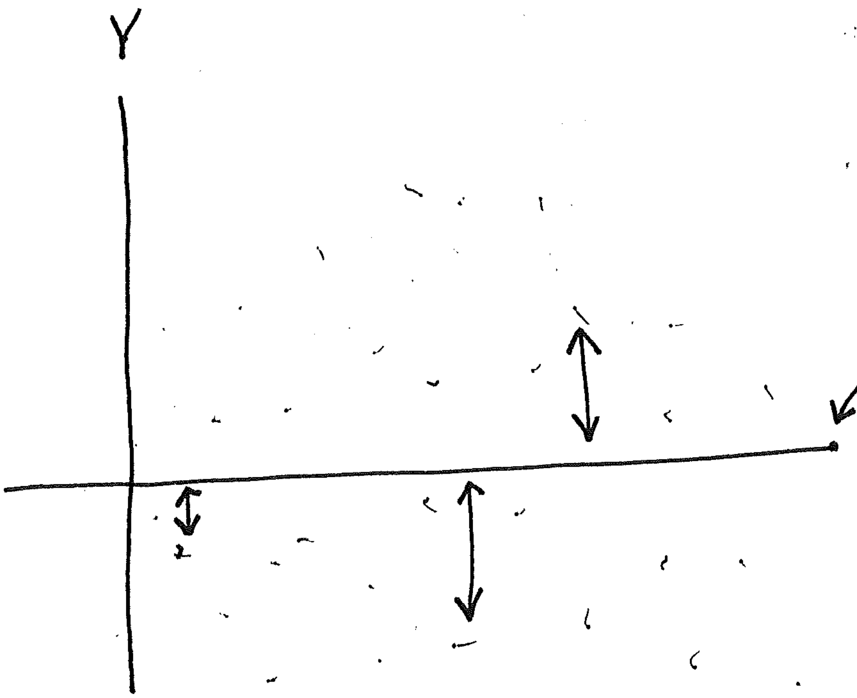
Ex#1: $X_i = 20$ hours

$E(Y|20) = \$5,000 + \$1,000 * 20 = \$25,000$

Ex#2: $X_i = 45$ hours

$E(Y|45) = \$5000 + 1000 * 45 = 50,000$

Estimate of Population Mean

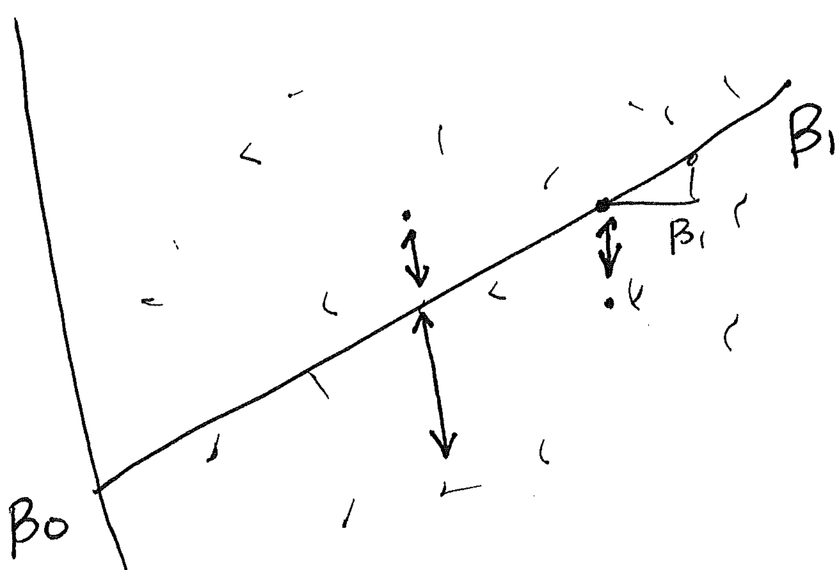


estimate of $\mu_Y = \bar{Y}$

Sum of Square~~errors~~
(by how much in total is our estimate off)

$$\sum_{i=1}^{N} (Y_i - \bar{Y})^2$$

OLS Prediction Line



$$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X_i$$

Sum of Square Errors

$$\sum_{i=1}^{N} (Y_i - \bar{Y})^2$$

① Population Regression Model

$Y_i = B_\phi + B_1 X_i + u_i$

Y_i = annual income ($)

X_i = hours worked per week

② OLS Prediction Line w/o estimates

$\hat{Y}_i = \hat{B}_\phi + \hat{B}_1 X_i$

③ OLS Prediction Line w/ estimates

$\hat{Y}_i = \$7477 + (503) X_i$

$\hat{B}_1$ = average change in Y for one-unit change in X

$\hat{B}_1$ = $503; a one-hour increase in hours worked per week is associated with a $503 increase in annual income

④ $X_i = 60$

$\hat{Y}_i = \$7477 + (503) * 60 = \$37,657$