Ralph's estimate

Ralph is interested in forecasting cash flows. He has very limited data (n = 3 observations) but believes the history provides equally reliable cash flow data.

$$\{y_1 = 6, y_2 = 4, y_3 = 5\}$$

Ralph knows the Gauss-Markov theorem describes ordinary least squares (OLS) as the best linear unbiased estimator for the data generating process (DGP)

$$y = X\beta + \varepsilon$$

where X is a matrix of regressors describing what is known about the relation (often linear such as for this DGP) between observable covariates and outcome y (here X is a vector of ones), β is the unknown vector of parameters of interest (here it is a scalar equal to the cash flow mean) and ε has mean zero and variance $\sigma^2 I$ (I is the n x n identity matrix and here $\sigma^2 = 1$). The OLS estimator for β is

$$b = (X^T X)^{-1} X^T y$$

and the variance of the estimator is

$$\text{Var}[b|X] = \sigma^2 \ (X^T X)^{-1}$$

Required:

1. Find the OLS estimator b for Ralph's cash flow data. How does this compare with the sample average for y?

2. Find the variance of the OLS estimator b for Ralph's cash flow data. How does this compare with the variance of the sample average for y?

3. Could the estimator describe accruals as an estimator of future cash flows? (Hint: consider straight-line amortization.)