Math323

Homework 4

November 23, 2021

Problem 3

Show that

Proof:

$$\frac{1}{N}\sum_{i=0}^{N-1}(x_i - m_x)(y_i - m_y) = \tag{1}$$

$$\frac{1}{N}\sum_{i=0}^{N-1} x_i y_i - x_i m_y - y_i m_x + m_x my = \tag{2}$$

$$\frac{1}{N}\sum_{i=0}^{N-1} x_i y_i - \frac{1}{N}\sum_{i=0}^{N-1} x_i m_y - \frac{1}{N}\sum_{i=0}^{N-1} y_i m_x + \frac{1}{N}\sum_{i=0}^{N-1} m_x m_y = \tag{3}$$

$$\frac{1}{N}\sum_{i=0}^{N-1} x_i y_i - \frac{m_y}{N}\sum_{i=0}^{N-1} x_i - \frac{m_x}{N}\sum_{i=0}^{N-1} y_i + \frac{1}{N}\sum_{i=0}^{N-1} m_x m_y = \tag{4}$$

$$\overline{xy} - m_y\bar{x} - m_x\bar{y} + \bar{x}\bar{y} = \tag{5}$$

$$\overline{xy} - \bar{x}\bar{y} - \bar{x}\bar{y} + \bar{x}\bar{y} = \tag{6}$$

$$\overline{xy} - \bar{x}\bar{y} \tag{7}$$

Homework 4 question 3

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1 Question 3

Consider the following:

$$s_{x_y}^2 \approx \overline{xy} - \bar{x}\bar{y} \tag{1}$$

$\overline{xy}$ is the sum of the product $\approx xy$ divided by N, likewise $\bar{x}\bar{y}$ is the product of the means of x, $y$respectively then this can be rewritten as the following:

$$s_x y^2 \approx \sum_{i=0}^{i-1} \frac{x_i yi}{N} - \sum_{i=0}^{i-1} \frac{xi}{N} \sum_{i=0}^{i-1} \frac{y_i}{N} \tag{2}$$