

# QUESTION 6

$$1. m(a + bx) = \frac{1}{N} \sum_{i=1}^N a + bx_i = \frac{1}{N} \left( \sum_{i=1}^N a + b \sum_{i=1}^N x_i \right)$$

$$a\left(\frac{1}{N}\right) + b \frac{1}{N} \sum_{i=1}^N x_i = a + b m(x) \quad \checkmark$$

$$2. \text{cov}(X, X) = \frac{1}{N} \sum_{i=1}^N (x_i - m(x))(x_i - m(x))$$

$$2 \frac{1}{N} \sum_{i=1}^N (x_i - m(x))^2 = s^2 \quad \checkmark$$

$$3. \text{cov}(X, a+bx) = \frac{1}{N} \sum_{i=1}^N (x_i - m(x))(a+bx_i - (a+bm(x)))$$

$$b x_i - b m(x) \rightarrow b(y_i - m(Y))$$

$$\frac{1}{N} \sum_{i=1}^N (x_i - m(x)) b(y_i - m(Y)) \rightarrow b \frac{1}{N} \sum_{i=1}^N (x_i - m(x))(y_i - m(Y)) \\ = b \text{cov}(X, Y) \quad \checkmark$$

$$4. \text{cov}(a+bx, a+bx) = \frac{1}{N} \sum_{i=1}^N (a+bx_i - (a+bm(x)))(a+bx_i - (a+bm(x))) \\ \frac{1}{N} \sum_{i=1}^N (bx_i - b m(x))(bx_i - b m(x)) \rightarrow \frac{1}{N} \sum_{i=1}^N b(x_i - m(x)) b(y_i - m(Y)) \\ = b^2 \frac{1}{N} \sum_{i=1}^N (x_i - m(x))(y_i - m(Y)) \rightarrow b^2 \text{cov}(X, Y) \quad \checkmark$$

$$5. b > 0$$

$$m \text{ed}(a+bx) = a+b m \text{ed}(X) \quad \checkmark$$

should be true since scales same

$$\text{IQR}(a+bx) = a+b \text{IQR}(X) \quad \times$$

$$= \mu + b Q_3(X) - (\mu + b Q_1(X))$$

False no a in the final answer

$$6. m(X^2) = \frac{1}{N} \sum_{i=1}^N x_i^2 \quad m(\sqrt{X}) = \frac{1}{N} \sum_{i=1}^N \sqrt{x_i}$$

$$x^2[1, 4] \quad (m(X))^2 = \left( \frac{1}{N} \sum_{i=1}^N x_i \right)^2 \quad \sqrt{m(X)} = \sqrt{\frac{1}{N} \sum_{i=1}^N x_i} \\ \frac{1}{2}(17) \neq \frac{1}{2}(5) \quad \frac{1}{2}(j) \neq \sqrt{\frac{1}{2}(5)}$$