

Business Mathematics (BK/IBA) – Quantitative Research Methods I (EBE)
Tutorial 1 – Answers

Summation

- A1 55
- A2 36
- A3 20
- A4 $4 \sum_{i=1}^n i$ or equivalently $\sum_{i=1}^n 4i$.
- A5 $\sum_{k=1}^n a_{ik} b_{kj}$
- A6 $\sum_{i=1}^5 3^i x^i$
- A7 720
- A8 $5 \frac{3113}{3600}$
- A9 315
- A10 9

Derivatives

- A1 $f(3) = 2; f'(3) = -\frac{1}{3}$
- A2 $f'(a) < 0, f'(b) = 0, f'(c) > 0, f'(d) < 0$
- A4 $-\frac{1}{x^{\frac{3}{2}}}$
- A5 $\frac{-5}{2A^3 \sqrt{A}}$
- A6 $-\frac{4x+5}{x^6}$
- A7 $y = x - 1$
- A8 $R'(P) = D(P) + PD'(P)$
- A9 $f'(x) = -\frac{5(2x+1)}{(x^2+x+1)^6}$
- A10 $\frac{dx}{dp} = -\frac{a}{2\sqrt{ap-c}}$

$$A11 \quad \frac{dC}{dx} = \frac{q}{\sqrt{25 - \frac{1}{2}x}}$$

$$A12 \quad \frac{dy}{dx} = (3 + x)x^2 e^x$$

$$A13 \quad \frac{dy}{dx} = (20x - 15)e^{2x^2 - 3x + 1}$$

$$\frac{d^2y}{dx^2} = 5[16x^2 - 24x + 13]e^{2x^2 - 3x + 1}$$

$$A14 \quad \frac{dy}{dx} = (1 + x \ln 2)2^x$$

$$A15 \quad \frac{dy}{dx} = 2x - \frac{2}{x}$$

$$\frac{d^2y}{dx^2} = 2 + \frac{2}{x^2}$$

Indexing

A1 u_1, u_2, \dots, u_{12} , where 1 codes for Groningen, 2 for Friesland, etc.

A2 Lack of ease, clarity, and flexibility.

A3 $u_{1,1}, u_{1,2}, u_{1,3}, u_{2,1}, u_{2,2}, u_{2,3}, \dots, u_{12,3}$, where the first index codes for the 12 provinces as above, and the second index codes for labour skill according to 1=high, 2=medium, 3=low.

Descriptive statistics

$$A1 \quad 2\frac{1}{3}$$

$$A2 \quad 13.87$$

$$A3 \quad 96$$

$$A4 \quad 200 \text{ cent}$$

$$A5 \quad \text{(b) and (c)}$$

$$A6 \quad \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x}) = \frac{1}{n-1} \sum_{i=1}^n x_i - \frac{1}{n-1} \sum_{i=1}^n \bar{x} = \frac{1}{n-1} \sum_{i=1}^n x_i - \frac{1}{n-1} n\bar{x} = \frac{1}{n-1} (\sum_{i=1}^n x_i - n\bar{x}) = \frac{1}{n-1} 0 = 0 \text{ QED}$$

$$A7 \quad 1.863 \text{ m}$$

$$A8 \quad -0.201$$

$$A9 \quad 0.611$$

$$A10 \quad \bar{x}_2 = \frac{1}{13} \sum_{i=1}^{13} x_{i,2}$$

A11
$$r_{x_1, x_2} = \frac{\sum_{i=1}^{13} (x_{i,1} - \bar{x}_1)(x_{i,2} - \bar{x}_2)}{\sqrt{\sum_{i=1}^{13} (x_{i,1} - \bar{x}_1)^2} \sqrt{\sum_{i=1}^{13} (x_{i,2} - \bar{x}_2)^2}}$$

A12 It is always 1 and hence conveys no information about the data set.

A13 (c), (e), (h)