

Sample solutions to the 2017 VCAA NHT papers

Question 2 (Specialist Mathematics Examination 1)

$$\frac{8}{(4+x)(4-x)} = \frac{A}{4+x} + \frac{B}{4-x}$$

$$8 = A(4-x) + B(4+x)$$

$$\text{When } x = 4, B = 1$$

$$\text{When } x = -4, A = 1$$

$$\int_{-2}^a \left(\frac{1}{4+x} + \frac{1}{4-x} \right) dx = \log_e(6)$$

$$[\log_e|4+x| - \log_e|4-x|]_{-2}^a = \log_e(6)$$

$$\left[\log_e \left(\frac{4+x}{4-x} \right) \right]_{-2}^a = \log_e(6) \text{ as } a \in (-2, 4)$$

$$\log_e \left(\frac{4+a}{4-a} \right) - \log_e \left(\frac{1}{3} \right) = \log_e(6)$$

$$\frac{3}{1} \left(\frac{4+a}{4-a} \right) = 6$$

$$\left(\frac{4+a}{4-a} \right) = 2$$

$$4+a = 8-2a$$

$$3a = 4$$

$$a = \frac{4}{3}$$

Multiple-Choice Question 4 (Specialist Mathematics Examination 2)

$$\sin(\theta + \phi) = \sin(\theta) \cos(\phi) + \cos(\theta) \sin(\phi) \quad : \boxed{1}$$

$$\sin(\theta - \phi) = \sin(\theta) \cos(\phi) - \cos(\theta) \sin(\phi) \quad : \boxed{2}$$

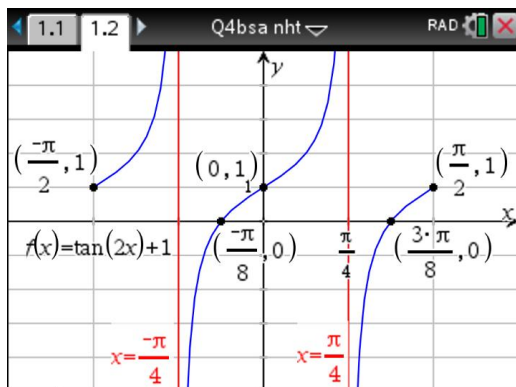
$$\boxed{1} + \boxed{2}: \quad \sin(\theta + \phi) + \sin(\theta - \phi) = 2\sin(\theta) \cos(\phi)$$

$$\therefore \sin(\theta) \cos(\phi) = \frac{a+b}{2}$$

E

Question 4 (Mathematical Methods Examination 1)

a.

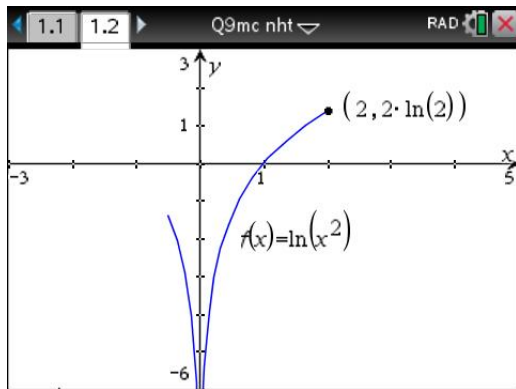


b. By observation, the average value is 1

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Multiple-Choice Question 9 (Mathematical Methods Examination 2)



C

Multiple-Choice Question 5 in Matrices (Further Mathematics Examination 1)

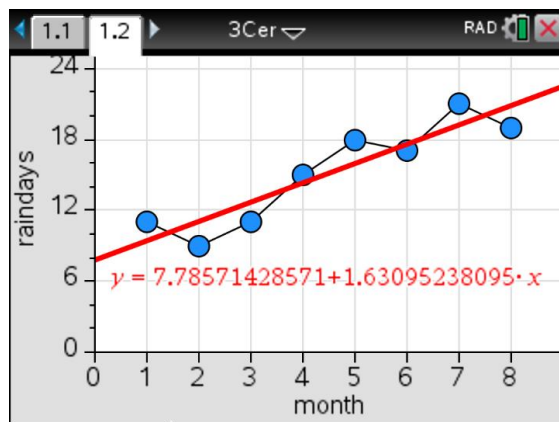
$$\begin{cases} 5p + 4m = 31 \\ 4p + 5m = 32 \end{cases} \quad \begin{bmatrix} 5 & 4 \\ 4 & 5 \end{bmatrix} \begin{bmatrix} p \\ m \end{bmatrix} = \begin{bmatrix} 31 \\ 32 \end{bmatrix} \begin{bmatrix} p \\ m \end{bmatrix} = \begin{bmatrix} 5 & 4 \\ 4 & 5 \end{bmatrix}^{-1} \begin{bmatrix} 31 \\ 32 \end{bmatrix}$$

or

$$\begin{cases} 4p + 5m = 32 \\ 5p + 4m = 31 \end{cases} \quad \begin{bmatrix} 4 & 5 \\ 5 & 4 \end{bmatrix} \begin{bmatrix} p \\ m \end{bmatrix} = \begin{bmatrix} 32 \\ 31 \end{bmatrix} \begin{bmatrix} p \\ m \end{bmatrix} = \begin{bmatrix} 4 & 5 \\ 5 & 4 \end{bmatrix}^{-1} \begin{bmatrix} 32 \\ 31 \end{bmatrix} = -\frac{1}{9} \begin{bmatrix} 4 & -5 \\ -5 & 4 \end{bmatrix} \begin{bmatrix} 32 \\ 31 \end{bmatrix}$$

C

Extended-Response Question 3c in Data Analysis (Further Mathematics Examination 2)



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