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Mathematics

9709/12

Paper 1 Pure Mathematics 1

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Question No (2)

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2 The graph of  $y = f(x)$  is transformed to the graph of  $y = f(2x) - 3$ .

- (a) Describe fully the two single transformations that have been combined to give the resulting transformation.

The point  $P(5, 6)$  lies on the transformed curve  $y = f(2x) - 3$ .

- (b) State the coordinates of the corresponding point on the original curve  $y = f(x)$ .

Solution:

(a)

The graph of  $y = f(ax)$  is a stretch of the graph  $y = f(x)$  with stretch factor  $\frac{1}{a}$  parallel

$$\text{For } y = f(2x) - 3$$

- (1) One transformation is stretch factor  $\frac{1}{2}$  in the  $x$  - direction.

The graph of  $y = f(x) + a$  is a translation of the graph  $y = f(x)$  by the vector  $\begin{pmatrix} 0 \\ a \end{pmatrix}$

- (2) Translation  $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$  or translation of 3 units in negative  $y$  - direction.

(b)

$$\text{As } P(5, 6) \text{ lie on } y = f(2x) - 3$$

$$\Rightarrow 6 = f(2(5)) - 3$$

$$6 = f(10) - 3$$

$$9 = f(10) \quad \because y = f(x)$$

**So point is (10, 9)**

