



TMUA 2017, Paper 1, Q18

18 The graph of $y = \log_{10}x$ is translated in the positive y -direction by 2 units.

This translation is equivalent to a stretch of factor k parallel to the x -axis.

What is the value of k ?

A 0.01

B $\log_{10} 2$

C 0.5

D 2

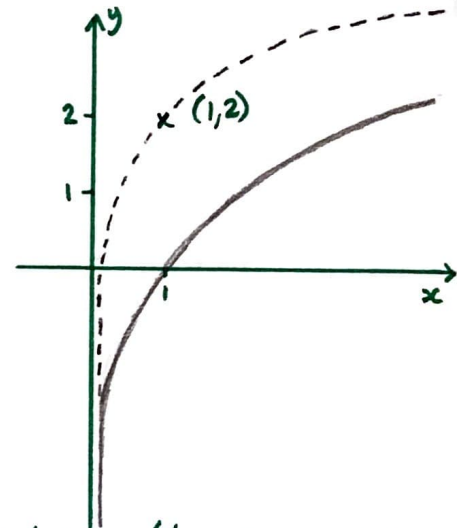
E $\log_2 10$

F 100

First we sketch the translation from $y = \log_{10}x$ to $y = \log_{10}x + 2$

$\log_{10} 1 = 0$ which gives $(1, 0)$

$\log_{10} 1 + 2 = 2$ which gives $(1, 2)$



A stretch of factor k parallel to the x -axis would yield the function

$$y = \log_{10}\left(\frac{x}{k}\right)$$

and because both translations are equivalent, the point $(1, 2)$ must lie on this curve

$$\text{I have } 2 = \log_{10} \frac{1}{k}$$

$$\Leftrightarrow 2 = \log_{10} 1 - \log_{10} k$$

using laws of logs

$$\Leftrightarrow \log_{10} k = -2$$

$$k = 10^{-2}$$

$$k = 0.01$$

raising both sides to base 10

and the correct answer is A