

TMUA 2021 Paper 1 Q4

Find the minimum value of the function

$$2^{2x} - 2^{x+3} + 4$$

A -16 The function rule can be re-written as follows

$$(2^x)^2 - 2^x \times 2^3 + 4$$

B -12

$$= (2^x)^2 - 8(2^x) + 4$$

C -8

D 0

E 4

This is a quadratic in 2^x so we can 'complete the square' to investigate the minimum value of the function, as follows

F 20

$$(2^x - 4)^2 - 16 + 4$$
$$= (2^x - 4)^2 - 12$$

we can see from this form that the function takes a minimum value when $2^x - 4 = 0$, that is at a value of -12

so the correct answer is B

note: it is worth checking that the value of x for which $2^x - 4 = 0$ actually exists. It does, as seen below

$$2^x - 4 = 0$$

$$\Leftrightarrow 2^x = 4$$

$$\Leftrightarrow x = 2$$