



## TMUA 2021 Paper 2 Question 5

On which line is the first error in the following argument?

- A  $\sin^2 x + \cos^2 x = 1$  for all values of  $x$ .
- B Therefore  $\cos x = \sqrt{1 - \sin^2 x}$  for all values of  $x$ .
- C Hence  $1 + \cos x = 1 + \sqrt{1 - \sin^2 x}$  for all values of  $x$ .
- D Thus  $(1 + \cos x)^2 = (1 + \sqrt{1 - \sin^2 x})^2$  for all values of  $x$ .
- E Substituting  $x = \pi$  gives  $0 = 4$ .

Line A is fine, since this is a trigonometric identity

Line B is found by taking only the positive square root

i.e.  $\sin^2 x + \cos^2 x = 1$

$$\Leftrightarrow \cos^2 x = 1 - \sin^2 x$$

$$\Leftarrow \cos x = \sqrt{1 - \sin^2 x}$$

This line is only true for some values of  $x$ , not all. Note the  $\Leftarrow$  symbol i.e. line A is necessary for line B but not sufficient

so the correct answer is B