

② Suppose  $3 + 2\sqrt{5}$  is rational

let  $3 + 2\sqrt{5} = \frac{p}{q}$  where  $p, q$  are integers  
and  $q \neq 0$

$$\Rightarrow 2\sqrt{5} = \frac{p}{q} - 3$$

$$\Rightarrow 2\sqrt{5} = \frac{p-3q}{q}$$

$$\Rightarrow \sqrt{5} = \frac{p-3q}{2q}$$

LHS =  $\sqrt{5}$  which is irrational

RHS =  $\frac{p-3q}{2q}$  is rational

[ $\because p-3q$  is an integer by closure property of integers for multiplication and subtraction

$2q$  is integer

and  $2q \neq 0 \because 2, q \neq 0$ ]

$\therefore$  LHS cannot be equal to RHS

our supposition is wrong

$3 + 2\sqrt{5}$  is irrational