



30) Suppose $\frac{1}{\sqrt{2}}$ is rational

let $\frac{1}{\sqrt{2}} = \frac{p}{q}$ where p, q are integers
and $q \neq 0$

$$\frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{p}{q}$$

$$\Rightarrow \frac{\sqrt{2}}{2} = \frac{p}{q}$$

$$\Rightarrow \sqrt{2} = \frac{2p}{q}$$

LHS = $\sqrt{2}$ which is irrational

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

[$2p$ is an integer by closure property of integers for multiplication
 q is an integer
and q is not equal to 0]

$$\therefore \text{LHS} \neq \text{RHS}$$

Our Supposition is wrong

$\therefore \frac{1}{\sqrt{2}}$ is an irrational number.