

December 24th

Find

$$\sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}$$

to infinity

$$\text{Let } x = \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}}$$

Now realise that the section highlighted must be equal to x

$$\sqrt{6 + \underbrace{\sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}}_x}$$

Leading to

$$x = \sqrt{6 + x}$$

Hence

$$x^2 = 6 + x \quad \text{so} \quad x^2 - x - 6 = 0$$

Solving this gives

$$\mathbf{x = 3}$$