

Issues from P4

Which sections of the specification do students need to know to do the question?

Is the question suitable (with rigorous wording etc) for a written examination.

Is the question better suited to classroom use?

Avoid this question!

1. Prove by contradiction that $\sqrt{3}$ is irrational.

2 If I use the same sort of process to 'prove' $\sqrt[4]{4}$ is irrational where does the process go wrong?

3 Prove that $\sqrt[3]{3}$ is irrational.

4. Suppose k is a rational number and n is an irrational number.

(a) Prove by contradiction that $k + n$ and kn are irrational.

Suppose both k and n are irrational.

(b) What can be concluded then?

5 Prove, by contradiction, that no power of 2 can be written as the sum of consecutive numbers.

6 Use a similar approach to that of finding $\int e^{2x} \cos x dx$ to find $\int \sec^4 x dx$

7 Make a critique of this proof of the irrationality of $\sqrt{2}$

Start with $(\sqrt{2} - 1)(\sqrt{2} + 1) = 1 \Rightarrow \sqrt{2} = \frac{1}{\sqrt{2} - 1} - 1$

Now let $\sqrt{2} = \frac{a}{b}$ where a, b are whole numbers in their lowest terms and $2b > a > b > 1$

So $\sqrt{2} = \frac{1}{\sqrt{2} - 1} - 1 \Rightarrow \sqrt{2} = \frac{1}{\frac{a}{b} - 1} - 1 = \frac{2b - a}{a - b}$

Now $2b - a$ and $a - b$ are positive whole numbers but $a - b < b$ and $2b - a < a$ so we have a new denominator and numerator