

Problem

Find the error in the following proof that $2 = 1$. Consider the equation $a = b$. Multiply both sides by a to obtain $a^2 = ab$. Subtract b^2 from both sides to get $a^2 - b^2 = ab - b^2$. Now factor each side, $(a+b)(a-b) = b(a-b)$, and divide each side by $(a-b)$ to get $a+b = b$. Finally, let a and b equal 1, which shows that $2 = 1$.

Step-by-step solution

Step 1 of 2

To prove: $2 = 1$

Given proof is:

- Consider the equation $a = b$
- Multiply both sides by a to obtain $a^2 = ab$
- Subtract b^2 from both sides to get $a^2 - b^2 = ab - b^2$
- Now factor each side, $(a+b)(a-b) = b(a-b)$
- Divide each side by $(a-b)$, to get $a+b = b$
- Let a and b equal 1, which shows that $2 = 1$.

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Step 2 of 2

The fallacy lies in the step which involves division by $(a-b)$, which is zero. Since a is equal to b as stated in the problem statement, $a - b$ gives zero. Since division by zero is undefined, the argument cannot be considered as valid.

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