

Evaluation of Proof Exercise

Following the instructions for [\(linked\)](#) *Evaluation of Proofs* exercises (which also are posted on the course homework page), evaluate the below justification of the given conjecture.

►. **Conjecture C.** For each real number  $x$ ,

$$x(1 - x) \leq \frac{1}{4}.$$

*Proposed Proof.* We will prove Conjecture C is true by using a proof by contradiction. By way of contradiction, assume that  $x \in \mathbb{R}$  satisfies that

$$x(1 - x) > \frac{1}{4}. \tag{1}$$

If we multiply both sides of the inequality in (1) by 4, we obtain

$$4x(1 - x) > 1. \tag{2}$$

However, if we let  $x = 3$ , we then see from (2) that

$$\begin{aligned} 4x(1 - x) &> 1 \\ 4 \cdot 3(1 - 3) &> 1 \\ 12(-2) &> 1 \\ -24 &> 1. \end{aligned} \tag{3}$$

The last inequality in (3) is clearly a contradiction. We have just shown that assuming Conjecture C is false leads to a contradiction.

We have proved Conjecture C is true. □

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