

# Proving Existence Constructively

Consider the statement:

*There exists a positive integer  $x$  such that  $x^3 - 4x^2 - x + 4 = 0$ .*

For each proof below, decide whether it does or does not prove this statement.

<p><i>Proof 1.</i> Suppose that <math>x^3 - 4x^2 - x + 4 = 0</math>. Then,</p> $x^2(x - 4) - (x - 4) = 0$ $(x - 4)(x^2 - 1) = 0$ <p>So, <math>x = 4</math> or <math>x = \pm 1</math>. Since <math>x = 1</math> is a positive integer, the claim is true. <math>\square</math></p>	<p><i>Proof 2.</i> Let <math>x = 1</math>. Then,</p> $\begin{aligned}x^3 - 4x^2 - x + 4 &= (1)^3 - 4(1)^2 - (1) + 4 \\ &= 1 - 4 - 1 + 4 \\ &= 0.\end{aligned}$ <p>So, the claim is true. <math>\square</math></p>
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