Show All Solutions

Rosen, Discrete Mathematics and Its Applications, 7th edition
Extra Examples
Section 5.3—Recursive Definitions and Structural Induction

Extra Examples — *Page references correspond to locations of Extra Examples icons in the textbook.*

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p.346, icon at Example 1

#1. Suppose $f(n+1) = \left\lfloor \dfrac{n^2 f(n) + 2}{n+1} \right\rfloor$ and $f(0) = 2$. Find $f(1)$, $f(2)$, $f(3)$, $f(4)$.

See Solution

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p.346, icon at Example 1

#2. Suppose

$$f(n) = \begin{cases} f(n-2) & \text{if } n \text{ is even} \\ f(n-2)+3 & \text{if } n \text{ is odd.} \end{cases}$$

Also suppose that $f(0) = 1$ and $f(1) = 4$. Find $f(7)$.

See Solution

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p.346, icon at Example 1

#3. Prove that the following proposed recursive definition of a function on the set of nonnegative integers fails to produce a well-defined function.

$$f(n) = \begin{cases} f(n-2) & \text{if } n \text{ is even} \\ 3f(n-2) & \text{if } n \text{ is odd} \end{cases}$$

with $f(0) = 4$.

See Solution

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p.346, icon at Example 1

#4. Prove that the following proposed recursive definition of a function on the set of nonnegative integers fails to produce a well-defined function.

$f(n) = f(f(n-1)) + 5,\ f(0) = 1.$

See Solution

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p.347, icon at Example 4

#1. For the sequence of Fibonacci numbers $f_0, f_1, f_2, \ldots$ $(0, 1, 1, 2, 3, 5, 8, 13, \ldots)$, prove that

$$f_0 + f_2 + f_4 + f_6 + \cdots + f_{2n} = f_{2n+1} - 1$$

for all $n \geq 0$.

See Solution

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p.347, icon at Example 4

#2. For the sequence of Fibonacci numbers $f_0, f_1, f_2, \ldots$ $(0, 1, 1, 2, 3, 5, 8, 13, \ldots)$, prove for all nonnegative integers n:

$$f_0^2 + f_1^2 + f_2^2 + \cdots + f_n^2 = f_n f_{n+1}.$$

See Solution

p.349, icon at Example 5

#1. Give a recursive definition for the set $S = \{4, 7, 10, 13, 16, 19, \ldots\}$.

See Solution