

Recursive Definitions and Structural Induction

CS/APMA 202

Rosen section 3.4

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Recursion

- Recursion means defining something, such as a function, in terms of itself
 - For example, let $f(x) = x!$
 - We can define $f(x)$ as $f(x) = x * f(x-1)$

Recursion example

- Rosen, section 3.4, question 1
 - Find $f(1)$, $f(2)$, $f(3)$, and $f(4)$, where $f(0) = 1$
 - a) Let $f(n+1) = f(n) + 2$
 - $f(1) = f(0) + 2 = 1 + 2 = 3$
 - $f(2) = f(1) + 2 = 3 + 2 = 5$
 - $f(3) = f(2) + 2 = 5 + 2 = 7$
 - $f(4) = f(3) + 2 = 7 + 2 = 9$
 - b) Let $f(n+1) = 3f(n)$
 - $f(1) = 3 * f(0) = 3*1 = 3$
 - $f(2) = 3 * f(1) = 3*3 = 9$
 - $f(3) = 3 * f(2) = 3*9 = 27$
 - $f(4) = 3 * f(3) = 3*27 = 81$