Reflexive ✓ aRb $a=b$
Symmetric ✓
Antisymmetric ✓
Transitive ✓

Recurrence Relations

$$T(n) = \begin{cases} T(n-1) + 3 & n > 1 \\ 5 & n = 1 \end{cases}$$

$T(n) = T(n-1) + 3$

$T(n-1) = T(n-2) + 3$

$T(n) = T(n-2) + 6$

$T(n-2) = T(n-3) + 3$

$T(n) = T(n-3) + 3 + k$

$T(n) = T(n-3) + 9$

$T(n) = T(n-x) + 3x$

General : $T(n) = T(n-x) + 3x$

$x = n-1 \quad \cancel{n}-(\cancel{n}+1)$

$T(n) = T(n-n+1) + 3(n-1)$

$T(n) = T(1) + 3n - 3$

$= 5 + 3n - 3$

Closed: $T(n) = 3n + 2$

Conjecture: The Rec. Rel.

$$T(n) = \begin{cases} T(n-1) + 3 & n > 1 \\ 5 & n = 1 \end{cases}$$

is represented by the closed form $T(n) = 3n + 2$

proof (induction):

Base Step: $T(1) = 5$, per R relat.

$T(1) = 3(1) + 2$

$= 3 + 2$

$= 5$, per cf

$5 = 5$, so the Base Step holds.

Inductive Hypothesis:

If $T(n) = \begin{cases} T(n-1)+3 & n>1 \\ 5 & n=1 \end{cases}$ is equivalent to the closed form $T(n) = 3n+2$, then it can be said that $T(K) = 3K+2$ and $T(K+1) = 3(K+1)+2$

$\hookrightarrow 3K+3+2$

$\hookrightarrow 3K+5$

Assume $T(k) = 3k+2$

Use Definition for $T(n)$ by ~~Definition~~ recurrence relatio

$T(k+1) = 3 + T((k+1)-1)$

$\hookrightarrow T(k+1) = 3 + T(k)$

from assumption $= T(k+1) =$

↳ $3 + 3k + 2$ ← assumption about the closed form =)

↳ $T(k+1) = 3k + 5$

↳ equal to hypothesis =)

Inductive Step Holds! $(3k+5 = 3k+5)$ =)

Basis Step Holds, IH holds, Inductive Step Holds

Qed

make that a sentence =)