Solving Square-Root Palindromes

In[28]:= $\text{Solve}\left[n + x == 2\,n + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{3 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{n+x}}}}}},\ x\right]$

Out[28]= $\left\{\left\{x \to -\frac{\sqrt{16 + 46\,n + 33\,n^2}}{\sqrt{33}}\right\},\ \left\{x \to \frac{\sqrt{16 + 46\,n + 33\,n^2}}{\sqrt{33}}\right\}\right\}$

Figure 1. Mathematica Display

$\text{Solve}\left[n + x == 2\,n + \cfrac{1}{k + \cfrac{1}{j + \cfrac{1}{k + \cfrac{1}{n+x}}}},\ x\right]$

$\left\{\left\{x \to -\sqrt{\frac{j + 2\,n + 2\,j\,k\,n + 2\,k\,n^2 + j\,k^2\,n^2}{k\,(2 + j\,k)}}\right\},\right.$

$\left.\left\{x \to \sqrt{\frac{j + 2\,n + 2\,j\,k\,n + 2\,k\,n^2 + j\,k^2\,n^2}{k\,(2 + j\,k)}}\right\}\right\}$

Figure 2. A Continued Fraction with Variables

$\text{Solve}\left[n + x == 2\,n + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{3 + \cfrac{1}{4 + \cfrac{1}{5 + \cfrac{1}{4 + \cfrac{1}{3 + \cfrac{1}{2 + \cfrac{1}{1 + \cfrac{1}{n+x}}}}}}}}}},\ x\right]$

$\left\{\left\{x \to -\frac{\sqrt{4920 + 14102\,n + 10105\,n^2}}{\sqrt{10105}}\right\},\right.$

$\left.\left\{x \to \frac{\sqrt{4920 + 14102\,n + 10105\,n^2}}{\sqrt{10105}}\right\}\right\}$

Figure 3. The Palindrome 1, 2, 3, 4, 5, 4, 3, 2, 1