$$S(n) = -0.358985\,S(n-3) + 0.811164\,S(n-2) + 0.2449102748\,S(n-1)$$

```
%s = [34 -25.566 17.4603 -28.631 10.4935 -26.486]
s = [80 -0.54966 44.5634 -18.2506 31.8758 -22.9951]
```

```
s = 1×6
   80.0000   -0.5497   44.5634  -18.2506   31.8758  -22.9951
```

```
% s = [61 1.81167 33.7272 -12.2536 22.9765 -16.3098]

A = [s(3) s(2) s(1);
     s(4) s(3) s(2);
     s(5) s(4) s(3)]
```

```
A = 3×3
   44.5634   -0.5497   80.0000
  -18.2506   44.5634   -0.5497
   31.8758  -18.2506   44.5634
```

```
B = [s(4);
     s(5);
     s(6)]
```

```
B = 3×1
  -18.2506
   31.8758
  -22.9951
```

```
C = A\B
```

```
C = 3×1
    0.2449
    0.8112
   -0.3590
```

```
rts = roots([1 -C(1) -C(2) -C(3)])'
```

```
rts = 1×3 complex
  -0.9711 + 0.0000i   0.6080 - 0.0034i   0.6080 + 0.0034i
```

```
rho = sqrt(real(rts(2))^2 + imag(rts(2))^2 )
```

```
rho = 0.6080
```

```
theta = atan(abs(imag(rts(2))/real(rts(2))))
```

```
theta = 0.0055
```

```
syms n
rs = [(rho^n) * cos(n*theta) (rho^n) * sin(n*theta) rts(1)^n];
rs = vpa(rs, 10)
```

rs =

$$(0.6080076577^n \cos(0.005539566703\, n) \quad 0.6080076577^n \sin(0.005539566703\, n) \quad (-0.9710862803)^n)$$

```
rsNew = [subs(rs, 0); subs(rs, 1); subs(rs, 2)];
rsNew = vpa(rsNew, 10)
```

rsNew =

$$\begin{pmatrix} 1.0 & 0 & 1.0 \\ 0.6079983288 & 0.00336808175 & -0.9710862803 \\ 0.3696506239 & 0.004095576151 & 0.9430085639 \end{pmatrix}$$

```
Sc = [s(1); s(2); s(3)]
```

```
Sc = 3×1
   80.0000
   -0.5497
   44.5634
```

```
B = vpa(rsNew \ Sc, 10)
```

B =

$$\begin{pmatrix} 49.99997463 \\ -539.4607682 \\ 30.00002537 \end{pmatrix}$$

```
syms n
Sn = B(1)*(rho^n)*cos(n*theta) + B(2)*(rho^n)* sin(n*theta) + B(3)*(rts(1)^n);
vpa(Sn, 10)
```

ans

$$= 49.99997463\, 0.6080076577^n \cos(0.005539566703\, n) - 539.4607682\, 0.6080076577^n \sin(0.005539566703\, n) + 30.0000253$$

```
vpa(subs(Sn, [0 1 2 3 4 5]), 20)
```

ans

$$= (80.0 \quad -0.54966 \quad 44.563400000000001455 \quad -18.250600000000034987 \quad 31.875800000000003452 \quad -22.995100000000061361)$$

```
s
```

```
s = 1×6
   80.0000   -0.5497   44.5634  -18.2506   31.8758  -22.9951
```

```
vpa(Sn, 10)
```

ans

$$= 49.99997463\, 0.6080076577^n \cos(0.005539566703\, n) - 539.4607682\, 0.6080076577^n \sin(0.005539566703\, n) + 30.0000253$$

```
snm1 = subs(Sn, n-1);
snm2 = subs(Sn, n-2);
snm3 = subs(Sn, n-3);
```

```
SnO = C(1)*snm1 + C(2)*snm2 + C(3)*snm3;

SnO = vpa(simplify(SnO),10);
ss = vpa(simplify(Sn), 10);

isequal(round(ss), round(SnO))
```

```
ans = logical
   1
```