

```
> with(combinat):
> phi:=(1+sqrt(5))/2;
```

$$\phi := \frac{1}{2} + \frac{\sqrt{5}}{2} \tag{1}$$

```
> for n from -1 to 20 do
n, fibonacci(n+1), evalf(
phi^(n+1)/sqrt(5)
-1/sqrt(5)*((1-sqrt(5))/2)^(n+1)
,25 );
#, evalf(0.7*phi^n,25), evalf(0.78*phi^n,25);
od;
```

```
          -1, 0, 0.
          0, 1, 1.000000000000000000000000
          1, 1, 0.9999999999999999999999998
          2, 2, 2.000000000000000000000001
          3, 3, 3.000000000000000000000002
          4, 5, 5.000000000000000000000003
          5, 8, 8.000000000000000000000007
          6, 13, 13.000000000000000000000002
          7, 21, 21.000000000000000000000002
          8, 34, 34.000000000000000000000004
          9, 55, 55.000000000000000000000006
          10, 89, 89.000000000000000000000014
          11, 144, 144.00000000000000000000002
          12, 233, 233.0000000000000000000003
          13, 377, 377.0000000000000000000007
          14, 610, 610.0000000000000000000009
          15, 987, 987.0000000000000000000018
          16, 1597, 1597.000000000000000000003
          17, 2584, 2584.000000000000000000005
          18, 4181, 4181.000000000000000000010
          19, 6765, 6765.000000000000000000015
          20, 10946, 10946.00000000000000000003
```

```
> expand(3-7/10*phi^3); (80/35)^2;
```

$$\frac{8}{5} - \frac{7\sqrt{5}}{10} = \frac{256}{49} \tag{3}$$

```
> 2*(20/7-3/2);
```

$$\frac{19}{7} \tag{4}$$

```
> (19/7)^2;
```

$$\frac{361}{49} \tag{5}$$

```
> 5*49;
```

$$245 \tag{6}$$

```
> solve(x^2+p*x+q,x);
```

$$-\frac{p}{2} + \frac{\sqrt{p^2-4q}}{2}, -\frac{p}{2} - \frac{\sqrt{p^2-4q}}{2} \tag{7}$$

```
> phibar:=(1-sqrt(5))/2;
```

$$phibar := \frac{1}{2} - \frac{\sqrt{5}}{2} \quad (8)$$

`> solve({c+cb=1,c*phi+cb*phibar=1},{c,cb});`

$$\left\{ c = \frac{1}{2} + \frac{\sqrt{5}}{10}, cb = \frac{1}{2} - \frac{\sqrt{5}}{10} \right\} \quad (9)$$