Untitled1

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In [1]:
```
import numpy as np
import math
```

In [2]:
```
TOL = 1e-5
N = 1000
x = np.zeros(81)
y = np.zeros(81)
w = 0.5
A = np.zeros([81, 81])
```

In [3]:
```
for i in range(1,81):
    A[i][i]=2*i
    if i>=3:
        A[i][i-2]=0.5*i
    if i>=5:
        A[i][i-4]=0.25*i
    if i<=76:
        A[i][i+4]=0.25*i
    if i<=78:
        A[i][i+2]=0.5*i

b = np.zeros(81)
for i in range(1,81):
    b[i] = math.pi
```

In [4]:
```
k = 1
while k <= N:
    for i in range(1,81):
        s = 0
        for j in range(1,i):
            s += A[i][j]*y[j]
        for j in range(i+1, 81):
            s += A[i][j]*x[j]
        s = -s + b[i]
        y[i] = (1 - w) * x[i] + w * s/A[i][i]
    norm = 0
    for i in range(1, 81):
        if abs(x[i] - y[i]) > norm :
```

```
                    norm = abs(x[i]-y[i])
            if norm < TOL:
                print("ans:",y)
                break
            k += 1
            for i in range(1,81):
                x[i]=y[i]
        print("iteration:",k)
```

```
ans: [0.         1.53871931 0.73141596 0.10797758 0.17328619 0.04056675
 0.08525282 0.16643611 0.1219754  0.10125101 0.09045734 0.07203373
 0.07026544 0.06875186 0.06324273 0.05971085 0.05570861 0.05187612
 0.04924649 0.04677802 0.04448352 0.04246521 0.04053487 0.03876926
 0.03717882 0.03570504 0.03434801 0.03309197 0.03191913 0.03082687
 0.02980714 0.02885208 0.02795668 0.02711503 0.02632223 0.02557441
 0.02486776 0.02419901 0.02356524 0.02296374 0.02239212 0.02184821
 0.02133004 0.02083584 0.02036398 0.01991299 0.01948151 0.0190683
 0.01867223 0.01829226 0.01792742 0.01757684 0.01723968 0.0169152
 0.0166027  0.01630149 0.01601103 0.01573078 0.01546012 0.01519877
 0.01494594 0.01470074 0.01446405 0.01423465 0.0140126  0.01380246
 0.01359368 0.01338407 0.01318753 0.01297109 0.01278599 0.01270287
 0.01252679 0.01237637 0.01220947 0.01129003 0.01114098 0.01217332
 0.01201765 0.01542884 0.01523785]
iteration: 21
```