

► In [10]: *# PROBLEM 4*

```
import random;
import numpy;

totalA = 0;
for a in range(10000):
    x1 = random.uniform(-1,1);
    x2 = random.uniform(-1,1);
    totalA += (x1 * numpy.sin(numpy.pi * x1) + x2 * numpy.sin(numpy.pi *
totalA /= 10000;

print("Average a: " + str(totalA));
```

Average a: 1.4373339896406343

In [9]: *# PROBLEM 6*

```
import random;
import numpy;

totalVar = 0;

for i in range(1000):
    totalA = 0;
    for a in range(1000):
        x1 = random.uniform(-1,1);
        x2 = random.uniform(-1,1);
        totalA += (x1 * numpy.sin(numpy.pi * x1) + x2 * numpy.sin(numpy.p
    totalA /= 1000;
    for a in range(1000):
        x1 = random.uniform(-1,1);
        totalVar += (1.425*x1 - totalA * x1) ** 2

totalVar /= 1000;
print("Variance: " + str(totalVar));
```

Variance: 0.2368655962220246

```
In [14]: # PROBLEM 7a

import random;
import numpy;

totalA1 = 0;
for a in range(10000):
    x1 = random.uniform(-1,1);
    x2 = random.uniform(-1,1);
    totalA1 += (numpy.sin(numpy.pi * x1) + numpy.sin(numpy.pi * x2)) / 2;

totalA1 /= 10000;
print(totalA1);

totalVar = 0;

for i in range(1000):
    totalA = 0;
    for a in range(1000):
        x1 = random.uniform(-1,1);
        x2 = random.uniform(-1,1);
        totalA += (numpy.sin(numpy.pi * x1) + numpy.sin(numpy.pi * x2)) / 2;
    totalA /= 1000;
    for a in range(1000):
        x1 = random.uniform(-1,1);
        totalVar += (totalA1 - totalA) ** 2

totalVar /= 1000;
print("Variance (7a) : " + str(totalVar));

-0.004718425405849692
Variance (7a) : 0.2622828014779997
```

In [15]: *# PROBLEM 7d*

```
import random;
import numpy;

totalA1 = 0;
for a in range(10000):
    x1 = random.uniform(-1,1);
    x2 = random.uniform(-1,1);
    totalA1 += (x1 ** 2 * numpy.sin(numpy.pi * x1) + x2 ** 2 * numpy.sin(numpy.pi * x2))

totalA1 /= 10000;
print(totalA1);

totalVar = 0;

for i in range(1000):
    totalA = 0;
    for a in range(1000):
        x1 = random.uniform(-1,1);
        x2 = random.uniform(-1,1);
        totalA += (x1 ** 2 * numpy.sin(numpy.pi * x1) + x2 ** 2 * numpy.sin(numpy.pi * x2))
    totalA /= 1000;
    for a in range(1000):
        x1 = random.uniform(-1,1);
        totalVar += (totalA1 * (x1 ** 2) - totalA * x1 ** 2) ** 2

totalVar /= 1000;
print("Variance (7d) : " + str(totalVar));
```

0.006986139755839163
 Variance (7d) : 0.08901902735967883

In []: