

Exercise No. 1

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2 - Numerical Integration

a)

```
1 import numpy as np
2 import matplotlib.pyplot as plt
3
4 a = 5
5 n = np.array([1, 5, 10, 20, 30, 50])
6 xdata = np.linspace(0, 1, 1000)
7
8 y = lambda x, a, n: x**n/(x+a)
9
10
11 plt.figure(figsize=(10, 5))
12
13 plt.xlabel('x')
14 plt.ylabel('y')
15
16 for it in n:
17     plt.plot(xdata, y(xdata, a, it))
18
19 plt.savefig('01-2a.png')
```

Listing 1: h

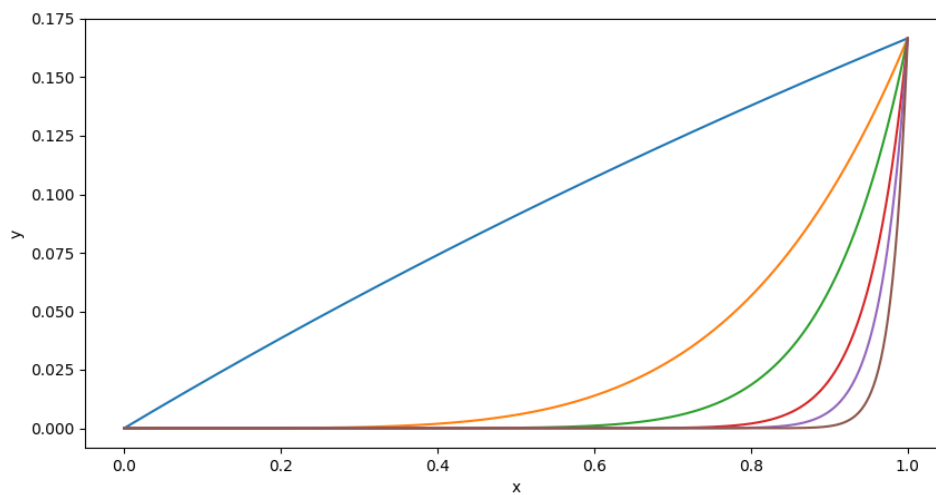


Figure 1: h

b)

```
1 import numpy as np
2 import sys
3 import pandas as pd
4
5 def y(a, n, y0):
6     if n == 0:
7         return y0
8     else:
9         return 1/n - a* y(a, n-1, y0)
10
11 if name == 'main':
12
13     # accepting args as: a, n0, y0, n1
14
15     print(sys.argv)
16
17     a = int(sys.argv[1])
18     n0 = int(sys.argv[2])
19     n1 = int(sys.argv[4])
20     y0 = int(sys.argv[3])
21
22     ndata = range(min(n0,n1),max(n0,n1)+1)
23     print(ndata)
24     ydata = [y(a, i, y0) for i in ndata]
25     print(ydata)
```

	n	y_n
0	10.0	-1.780484e+06
1	11.0	8.902420e+06
2	12.0	-4.451210e+07
3	13.0	2.225605e+08
4	14.0	-1.112802e+09
5	15.0	5.564012e+09
6	16.0	-2.782006e+10
7	17.0	1.391003e+11
8	18.0	-6.955015e+11
9	19.0	3.477508e+12
10	20.0	-1.738754e+13

c)