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))
```

Listing 1: h

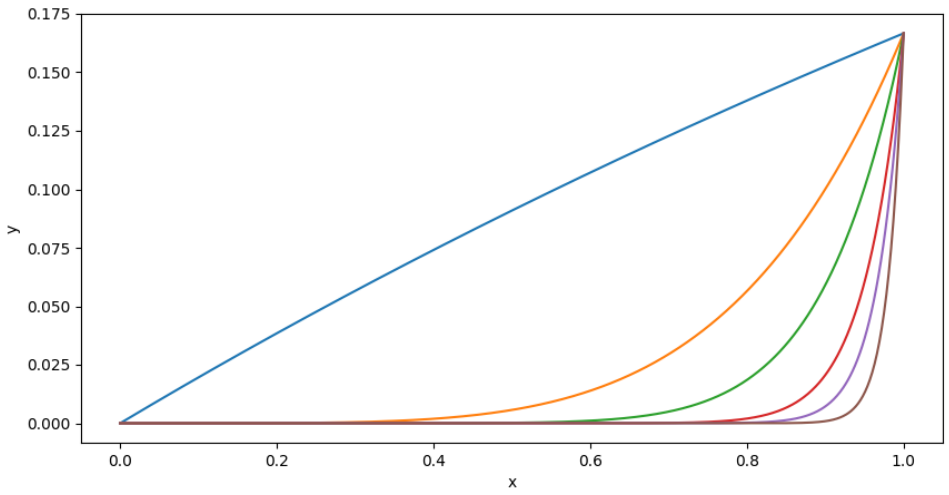

Figure 1: h

b)

```python
import numpy as np
import sys
import pandas as pd

def y(a, n, y0):
    if n == 0:
        return y0
    else:
        return 1/n - a* y(a, n-1, y0)

if __name__ == '__main__':

    # accepting args as: a, n0, y0, n1

    print(sys.argv)

    a = int(sys.argv[1])
    n0 = int(sys.argv[2])
    n1 = int(sys.argv[4])
    y0 = int(sys.argv[3])

    ndata = range(min(n0,n1),max(n0,n1)+1)
    print(ndata)
    ydata = [y(a, i, y0) for i in ndata]
    print(ydata)
```

w2

	n	$y_n(5)$
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)