

CP1 Blatt2 Abgabe Lapp & Brieden

November 6, 2017

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```
In [2]: import numpy as np
import matplotlib.pyplot as plt
import time as time
%matplotlib inline
plt.rcParams['figure.figsize'] = (15.0, 4.0)
plt.rcParams['figure.dpi'] = 120
plt.rcParams['font.size'] = 16
```

1 Aufgabe

```
In [3]: def tanh_exact(x):
        y = np.exp( 2 * x )
        return (y - 1) / (y + 1)
def tanh_taylor(x):
    return x - x**3/3 + 2*x**5/15 - 17*x**7/315

def runtime(func, x_all):
    t0 = time.time()
    for x in x_all:
        tanh_exact(x)
    return time.time() - t0

n = 1000000
x_all = np.linspace(0,1, n)
print("Runtime of %i times: \n The approache with sinh(x)/cosh(x)\
needs %.4f seconds and the approache with Taylor series %.4f seconds"
      %(n, runtime(tanh_exact, x_all), runtime(tanh_taylor, x_all)) )
```

Runtime of 1000000 times:

The approache with sinh(x)/cosh(x) needs 2.0185 seconds and the approache with Taylor series 1

2 Aufgabe

Analytical we get the result: $\sum_n^{\infty} \frac{2n+1}{n^2(n+1)^2} = 1$