Tartalomjegyzék

1. Exercise

3 points

The Collatz or *3n+1* problem is the following:

- Let *n* be a positive integer.
- Let *g(n) = n/2* is *n* is even and *3n+1* is odd.
- Then one can iterate *g* over-and-over for any given number. For example starting with 98:

```
{98, 49, 148, 74, 37, 112, 56, 28, 14, 7, 22, 11, 34, 17, 52, 26, 13, 40, 20, 10, 5, 16, 8, 4, 2,
```

It is an interesting and **unproven conjecture** that starting from any number, you will reach 1 sooner or later.
In the example above it took 25 steps. For example *5 -> 16 -> 8 -> 4 -> 2 -> 1* takes 5 steps.

Plot the number of steps needed to reach one against *n*, use **ListPlot** and *n=1...1000*

2. Exercise

a)

3 points

Define a function *T* with three arguments:

- *f* a function
- *n* a natural number
- *x0* a real number

For this values calculate the n^{th} Taylor polynomial of *f* around *x0*.

For example:

```
In[1]:=  T[Exp,4,0]
Out[1]:= 1 + x + x^2/2 + x^3/6 + x^4/24
```

Note that there is a buit-on function **Series** which does exactly this, but don't use that, implement it on your own! Use the sum symbol from the paletta and the **Derivative**.

b)

3 points

Plot the function e^{-x^2} and its derivatives on a single **Plot**. For a given *M*, plot $f, f', f'' \cdots f^{(M)}$ on the interval [− 2,2] (this is *M+1* functions in total). Use **Manipulate** to set the value of *M*.

Handing in

Deadline: 2018.11.25 23:59

Attach the solution notebook file to the email named like this (use your own login, not mine):

```
A1_borbely_HW6.nb
```