EX.0.1.1, Sauer

Rewrite the following polynomials in nested form. Evaluate with and without nested form at $x = 1/3$.

a. $p(x) = 6x^4 + x^3 + 5x^2 + x + 1$

b. $p(x) = -3x^4 + 4x^3 + 5x^2 - 5x + 1$

c. $p(x) = 2x^4 + x^3 - x^2 + 1$

You can use python to perform the computation but you cannot use a `for` loop or a function. Only multiplications, additions and parenthesis.

EX.0.1.1, Sauer, solution, Langou

See as well the Colaboratory Jupyter Notebook.

In nested form,

a. $p(x) = 6x^4 + x^3 + 5x^2 + x + 1 = ((6x + 1)x + 5)x + 1)x + 1$

b. $p(x) = -3x^4 + 4x^3 + 5x^2 - 5x + 1 = ((-3x + 4)x + 5)x - 5)x + 1$

c. $p(x) = 2x^4 + x^3 - x^2 + 1 = ((2x + 1)x - 1)x^2 + 1$

And we can check that, using either standard form or nested form to evaluate the polynomial at $x = \frac{1}{3}$, we get

a. $p(\frac{1}{3}) = 2$

```
x = 1./3.
print( 6. * x**4 + x**3 + 5. * x**2 + x + 1. )
print( ( ( ( 6. * x + 1. ) * x + 5. ) * x + 1. ) * x + 1. )
```

```
2.0
2.0
```

b. $p(\frac{1}{3}) = 0$

```
x = 1./3.
print( -3. * x**4 + 4. * x**3 + 5. * x**2 - 5. * x + 1. )
print( ( ( ( -3. * x + 4. ) * x + 5. ) * x + -5. ) * x + 1. )
```

```
1.1102230246251565e-16
0.0
```

c. $p(\frac{1}{3}) = \frac{77}{81}$

```
x = 1./3.
print( 2. * x**4 + x**3 - x**2 + 1. )
print( ( ( ( 2. * x + 1. ) * x - 1. ) * x ) * x + 1. )
print( 77./81. )
```

```
0.9506172839506173
0.9506172839506173
0.9506172839506173
```