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Lab 8

COMP9021, Session 2, 2015

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1 ☞ Doubly linked lists

Modify the module `linked_list.py` which is part of the material of the 8th lecture into a module `doubly_linked_list.py`, to process lists consisting of nodes with a reference to both next and previous nodes, so with the class `Node` defined as follows.

```
class Node:
    def __init__(self, value = None):
        self.value = value
        self.next_node = None
        self.previous_node = None
```

2 Using linked lists to represent polynomials

Write a program that implements a class `Polynomial`. An object of this class is built from a string that represents a polynomial, that is, a sum or difference of monomials.

- The leading monomial can be either an integer, or an integer followed by `x`, or an integer followed by `x^` followed by a nonnegative integer.

- The other monomials can be either a nonnegative integer, or an integer followed by `x`, or an integer followed by `x^` followed by a nonnegative integer.

Spaces can be inserted anywhere in the string.

A monomial is defined by the following class:

```
class Monomial:
    def __init__(self, coefficient = 0, degree = 0):
        self.coefficient = coefficient
        self.degree = degree
        self.next_monomial = None
```

A polynomial is a linked list of monomials, ordered from those of higher degree to those of lower degree. An implementation of the `__str__()` method allows one to print out a polynomial.

Next is a possible interaction.

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```
$ python
...
>>> from polynomial import *
>>> Polynomial('-0')
Incorrect input
>>> Polynomial('+0')
Incorrect input
>>> Polynomial('0x^-1')
Incorrect input
>>> Polynomial('2x + +2')
Incorrect input
>>> Polynomial('2x + -2')
Incorrect input
>>> Polynomial('2x - +2')
Incorrect input
>>> poly_0 = Polynomial('0')
>>> print(poly_0)
0
>>> poly_0 = Polynomial('0x')
>>> print(poly_0)
0
>>> poly_0 = Polynomial('0x^0')
>>> print(poly_0)
0
>>> poly_0 = Polynomial('0x^5')
>>> print(poly_0)
0
>>> poly_1 = Polynomial('x')
>>> print(poly_1)
x
>>> poly_1 = Polynomial('1x')
>>> print(poly_1)
x
>>> poly_1 = Polynomial('1x^1')
>>> print(poly_1)
x
>>> poly_2 = Polynomial('2')
>>> print(poly_2)
2
>>> poly_2 = Polynomial('2x^0')
>>> print(poly_2)
2
>>> poly_3 = Polynomial('1 + 2-3 +10')
>>> print(poly_3)
10
>>> poly_4 = Polynomial('x + x - 2x -3x^1 + 3x')
>>> print(poly_4)
0
>>> poly_5 = Polynomial('x + 2 + x - x -3x^1 + 3x + 5x^0')
>>> print(poly_5)
x + 7
>>> poly_6 = Polynomial('-2x + 7x^3 +x   - 0  + 2 -x^3 + x^23 - 12x^8 + 45 x ^ 6 -x^47')
>>> print(poly_6)
-x^47 + x^23 - 12x^8 + 45x^6 + 6x^3 - x + 2
```