In [ ]:
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Computational Mathematic Lab 1. Horner's Scheme
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IT3-2208
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In [ ]:
```
Find the value of the polynomial P(x) using the Horner's scheme.

The report contains:
Code implementation (50%)
Output of the program (25%)
Solution by hand (25%)
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In [ ]:
```
Exercise 1) Code Implementation
```

In [1]:
```
def compute_poly(n:int, coefs:list[int]|tuple[int], a):
    try:
        result = coefs[0]
    except IndexError:
        result=0 # automatically 0 if no coefficients passed

    for value in coefs[1:]:
        # start from element with index 1
        result = result*a + value
    return result
```

In [ ]:
```
Exercise 2) Output of the program
```

In [2]:
```
linear_polynom = ( # P(x) = 3x + 2 when x = 4
    1, # the degree of the polynomial
    (3,2), # coefficients
    4 # value
)
quadratic_polynom = ( # P(x) = 2x^2 - 5x + 3 when x = 2
    2,
    (2, -5, 3),
    2
)
cubic_polynom = ( # P(x) = x^3 - 4x^2 + 6x - 2 when x = 3
    3,
    (1, -4, 6, -2),
    3
)
```

In [3]:
```
print(f'Linear polynomial: P(x) = 3x + 2 when x = 4')
print(f'Computed value: {compute_poly(*linear_polynom)}', end='\n\n')

print(f'Quadratic polynomial: P(x) = 2x^2 - 5x + 3 when x = 2')
print(f'Computed value: {compute_poly(*quadratic_polynom)}', end='\n\n')

print(f'Cubic polynomial: P(x) = x^3 - 4x^2 + 6x - 2 when x = 3')
print(f'Computed value: {compute_poly(*cubic_polynom)}', end='\n\n')
```

```
Linear polynomial: P(x) = 3x + 2 when x = 4
Computed value: 14

Quadratic polynomial: P(x) = 2x^2 - 5x + 3 when x = 2
Computed value: 1

Cubic polynomial: P(x) = x^3 - 4x^2 + 6x - 2 when x = 3
Computed value: 7
```

In [ ]:
```
Linear Polynomial: P(x) = 3x + 2 when x = 4
Using Horner's Scheme: P(x) = 3x + 2
To compute P(4): P(4) = 3 * 4 + 2 = 12 + 2 = 14

Quadratic Polynomial: P(x) = 2x^2 - 5x + 3 when x = 2
Using Horner's Scheme: P(x) = 2x^2 - 5x + 3 P(x) = ((2x - 5)x + 3)
To compute P(2): P(2) = ((2 * 2 - 5) * 2 + 3)
P(2) = ((4 - 5) * 2 + 3)
P(2) = (-1 * 2 + 3)
P(2) = -2 + 3
P(2) = 1

Cubic Polynomial: P(x) = x^3 - 4x^2 + 6x - 2 when x = 3
Using Horner's Scheme: P(x) = x^3 - 4x^2 + 6x - 2 P(x) = ((x - 4)x + 6)x - 2
To compute P(3): P(3) = (((3 - 4) * 3 + 6) * 3 - 2)
P(3) = ((-1 * 3 + 6) * 3 - 2)
P(3) = (3 * 3 - 2)
P(3) = 9 - 2
P(3) = 7
```