

## MATH 305      Polynomials – Nested Form

If exact arithmetic is used to evaluate the polynomial

$$f(x) = 2.753x^3 - 2.958x^2 + 3.169x - 4.675 \quad (1)$$

at  $x = 1.077$ , the result is  $-1.2538\ 8953\ 5651$ . In *nested form*, the same polynomial is

$$f(x) = ((2.753x - 2.958)x + 3.169)x - 4.675. \quad (2)$$

- How many multiplications are there in form (1)? How many additions/subtractions?
- How many multiplications are there in form (2)? How many additions/subtractions?

1. Evaluate the polynomial (2) at  $x = 1.077$  using

(a) exact arithmetic,

(b) 3-digit chopping arithmetic

Answer:  $-1.32$  (Yes, that *is* the answer you're supposed to get.)

(c) 3-digit rounding arithmetic

Answer:  $-1.25$  (Yes, that *is* the answer you're supposed to get.)

2. Determine the absolute error and the percent error in the results from (b) and (c).

3. Use Maple to evaluate the polynomial at  $x = 1.077$ .

Write the following polynomials in nested form.

1.  $f(x) = x^7 - 6x^6 + 3x^4 - 2x^3 + 12x + 5$

answer:  $f(x) = (((((x - 6)x^2 + 3)x - 2)x^2 + 12)x + 5$

2.  $f(x) = 8x^2 - 4x^5 + 2x^6 - 9 + x^8$

answer:  $f(x) = (((x^2 + 2)x - 4)x^3 + 8)x^2 - 9$