

# Aero 320: Numerical Methods

## Lab Assignment 4

Fall 2013

### Problem 1

#### Standard deviation and linear error propagation

A triangle is constructed using three rods as its sides. Due to measurement errors, the lengths of these rods, say  $a$ ,  $b$ , and  $c$ , are not exactly known.

- (i) If the measurement uncertainties are given by the respective standard deviations:  $\sigma_a$ ,  $\sigma_b$  and  $\sigma_c$ , then what is the uncertainty/standard deviation in computing the *perimeter* of the triangle?
- (ii) If the expected/average measurements of the lengths of the rods are  $\bar{a}$ ,  $\bar{b}$  and  $\bar{c}$ , then according to linear error propagation, what is the uncertainty/standard deviation in computing the cosine of the angle opposite to the rod of length  $c$ ?
- (iii) Write a program that takes  $\bar{a}$ ,  $\bar{b}$ ,  $\bar{c}$ ,  $\sigma_a$ ,  $\sigma_b$  and  $\sigma_c$  as user inputs, and then computes the answers of part (i) and (ii).