

**Math 1080: Spring 2008**

**Homework #4**

**Due Feb 18**

**Problem 1:**

Find the relative condition number for the following problems:

a)  $f(x) = \cos(x)$

b)  $f(\mathbf{x}) = \|\mathbf{x}\| = \sqrt{\sum_{i=1}^n x_i^2}$

c)  $f(x) = \frac{1}{1+x^2}$

**Problem 2:**

Determine whether the following algorithms are backward stable, stable, or unstable:

a) Computation of  $f(x) = \frac{1}{1+x}$  as  $\tilde{f}(x) = 1 \ominus (1 \oplus \text{fl}(x))$

b) Computation of  $f(x, y) = x^2 - y^2$  as  $\tilde{f}(x, y) = [\text{fl}(x) \otimes \text{fl}(x)] \ominus [\text{fl}(y) \otimes \text{fl}(y)]$

c) Computation of  $f(x, y) = x^2 - y^2$  as  $\tilde{f}(x, y) = [\text{fl}(x) \oplus \text{fl}(y)] \otimes [\text{fl}(x) \ominus \text{fl}(y)]$

**Problem 3:**

Determine the accuracy of the algorithms b) and c) of Problem 2. Which is more accurate?