



## Quiz #1

Student Name:

Student ID:

1.

(a) Evaluate the polynomial

$$y = x^3 - 7x^2 + 8x - 0.35$$

at  $x=1.37$ . Use 3-digit arithmetic with chopping. Evaluate the percent relative error.

(b) Repeat (a) but express  $y$  as

$$y = ((x - 7)x + 8)x - 0.35$$

Evaluate the error and compare with part (a).

2. Use of Taylor series expansions to approximate the following functions with  $x_0=0$

(a)  $f(x) = \sqrt{x^2 + 1} - x$

(b)  $f(x) = \frac{\sin x}{1 + \cos x}$

3. The following infinite series can be used to approximate  $e^x$ :

$$e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{3!} + \dots + \frac{x^n}{n!}$$

(a) Prove that this Maclaurin series expansion is a special case of the Taylor series expansion with  $x_i = 0$  and  $h = x$ .

(b) Use the Taylor series to estimate  $f(x) = e^{-x}$  at  $x_{i+1}=1$  for  $x_i=0.2$ . Employ the zero-, first-, second-, and third-order versions and compute the  $|\epsilon^t|$  for each case.