(25) 1. Finite precision arithmetic.

(a) Let $a = 0.0079346$ and $b = 42.0963$. Compute the 3 (decimal) digit rounding representations of a and b, call them $\bar{a}$ and $\bar{b}$ respectively.

i. $\bar{a} =$

ii. $\bar{b} =$

iii. What is the relative error in $\bar{a}$?

(b) Describe the machine epsilon?

(c) What do we mean by overflow?

(d) What is cancellation?

(e) What is 17.4267 in base 5? (just kidding)
What can you say about s if $\text{fl}(s + 1,000,000) = 1,000,000$?

(10) 2. Let $P(x) = 4x^3 - x^2 + 2x + 3$.

(a) Use Horner's method to find $P(2)$.

(b) What is the remainder when P is divided by $(x - 2)$?

(5) 3. Briefly describe Mueller's method.

(5) 4. How would you suggest finding all of the roots of a polynomial of degree $n > 8$?

(35) 5. Let $f(x) = x^2 - 5$. We're looking for a zero of f.

(a) Use the bisection method with $a = 2$ and $b = 3$ to find an interval of length strictly less than $1/4$ which brackets a zero of f.

(b) Use one iteration of Newton's method to improve the guess $x_0 = 2$.

(c) Starting with $x_0 = 2$ and $x_1 = 2.2$, use one iteration of the secant method to find x_2.

(d) Define the *order of convergence* of a sequence.

(e) What is the order of convergence for bisection and the secant methods?

(20) 6. Let $f(x) = x^2 e^x$.

(a) State the Taylor polynomial theorem in its general form.

(b) Compute $P_2(x)$, the degree 2 Taylor polynomial for f at $x_0 = 0$.

(c) Use P_2 to approximate $f(0.25)$.

(d) What is the remainder term associated with P_2 at $x = 0.25$?