

Name: _____

- (24) 1. Let $f(x) = x^2 + 2x - 8$. We're looking for a zero of f .
- (a) Use the bisection method with $a = 0$ and $b = 6$ to find an interval of length strictly less than 3 which brackets a zero of f .

 - (b) Use one iteration of Newton's method to improve the guess $p_0 = 3$ (that is, find p_1).

 - (c) With $p_0 = 4$ and $p_1 = 3$, use one iteration of the secant method to find p_2 .
- (4) 2. Let $P(x) = 2x^3 - x^2 + 3x - 3$ and use Horner's method to find $P(2)$.

- (6) 3. Describe a stabilized deflation method for finding *all* of the roots of a polynomial of degree n .

- (26) 4. Finite precision floating point arithmetic.

(a) Let $a = 0.0047923$ and $b = 2402.56$. Compute the 4 decimal-digit rounding representations of a and b , call them \bar{a} and \bar{b} respectively.

i. $\bar{a} =$

ii. $\bar{b} =$

(b) State the Floating Point Representation Theorem (about the error made in rounding, and don't forget the hypotheses).

(c) What do we mean by *overflow*?

(d) What is *digit cancellation*?

- (8) 5. Let $f(x) = \frac{1}{2-x}$.
- (a) Compute $P_1(x)$, the degree 1 Taylor polynomial for f at $x_0 = 0$.
- (b) Use P_1 to approximate $f(1/2)$.
- (4) 6. How many multiplications are required to evaluate an arbitrary real polynomial of degree n at a real number? Explain.
- (8) 7. Briefly describe Mueller's method for finding a zero of a function.

(10) 8. Conditioning

(a) What does *illconditioning* mean in a mathematical problem?

(b) What is the absolute condition number for the problem “find x^* so that $f(x^*) = 0$ ”?

(10) 9. Compare and contrast properties related to performance and generality of bisection, Newton’s method and the secant method.