Math 351 Final Info

Wednesday, March 20, 6pm

- Can bring a new 3”x5” note card + midterm note card

Topics:

1. **3.1 Bisection Method (p. 72)**
   1. **Def:** Suppose that is continuous on an interval and that   
      Then changes sign on , and has at least 1 root on the interval.
   2. Define c = (a +b) /2
   3. If , then accept c as the root and stop.
   4. If ,   
       set .  
      else  
       set .   
       return to step b.
2. **3.2 Newton’s Method (p. 79)**
   1. Pictures
   2. Tangent
   3. Derive
   4. How it could go wrong
   5. error analysis
   6. needs f’
3. **3.3 Secant Method (p. 90)**
   1. Same as above
   2. don’t need f’
4. **3.5 Ill-behaved root finding problem (p. 109)**
   1. Multiple roots.
   2. Newton’s method is slower.
   3. sensitive to perturbation in coefficients
   4. ε can alter the graph (move up/down graph)
   5. finite precision
5. **2.2.2 Loss of significance (p. 47)**
6. **2.1 Floating Point Numbers (p.34)**
7. **4.1 Polynomial Interpolation (p. 118)**
   1. Lagrange form
      1. N+1 points
      2. Poly degree n or less
   2. Linear Interpolation (4.1.1)
   3. Quadratic Interpolation (4.1.2)
8. **4.2 Error in Polynomial Interpolation (p. 138)**
   1. Given Function defined on an interval , let denote the polynomial of degree interpolating at points
   2. Theorem 4.2.1  
      Let , let f(x) have continuous derivatives on , and let be distinct node points in [a,b]. then   
      for , where is an unknown point between the minimum and maximum of .
   3. Want f-p = 0.
9. **4.2.2 Behavior of the error**
   1. Evenly spaced points creates errors (bigger on outside).
   2. End points.
10. **4.5 Chebyshev Polynomial (T, C)**
    1. cos(nθ)
    2. oscillation (-1,1)
    3. oscillation (a,b)
    4. Leads to near-minimax approximation.
11. **4.6 Near-minimax approximation**
    1. error → equioscillation property p of ° ≤ n, at least n+2 extrema of alternating sign and equal magnitude
    2. “Spread the pain / joy equally”
12. **## Data-Fitting**
    1. different from book, linear algebra
    2. c=A\b
    3. polyfit is least squares.
13. **5.1 Trapezoidal Rule , Simpson’s Rule**
    1. Theorem 5.2.1 (p 204) – Trapezoidal Rule
    2. Theorem 5.2.5 (p 208) – Simpson’s Rule
    3. Integral > deriving by hand
    4. Trapezoidal is crude/better than rectangle.
    5. Gaussian Quadrature (cancelled → error)
14. **5.2 Error Formula**
    1. Trapezoidal
    2. Simpsons
15. **5.2.3 Richardson Extrapolation**
    1. + more w/ ln
    2. Romberg Interpolation (not in the book)

“Don’t take your nap during the first 30min of the exam. Take the nap in the middle of the exam.”