Lecture-15

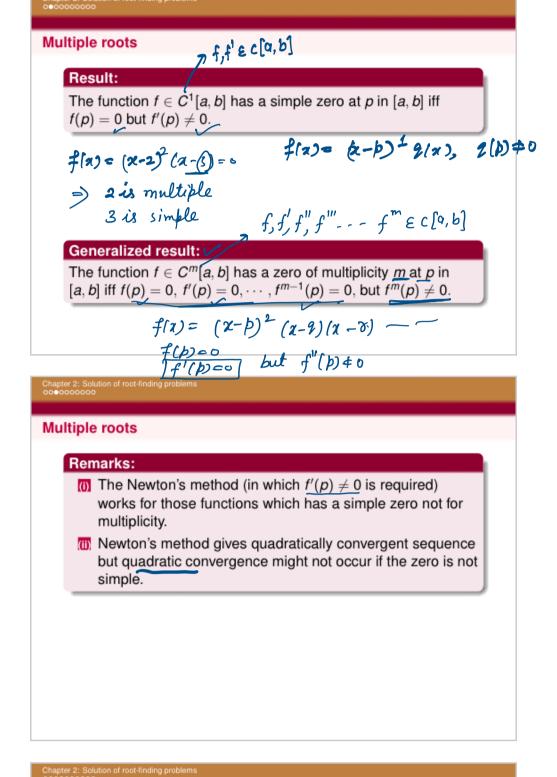
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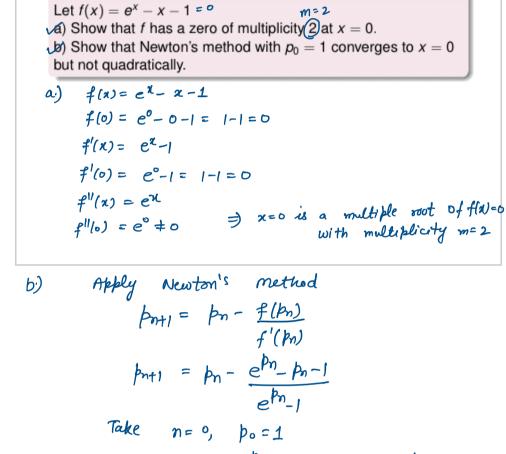


Lecture-15

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Lecture 15: Numerical Analysis (UMA011)
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Multiple roots
     Definition:
      An equation f(x) = 0 has a root p with multiplicity m if for
     x \neq p, we can write f(x) = (x - p)^m g(x), g(p) \neq 0
                                                                                              2(b)=0
      If m = 1, then equation f(x) = 0 has a simple root at p.
                        f(x) = (x-2)^{2}(x-3)
f(x) = (x^{2}-14x+49)(x-5)
f(x) = (x^{2}-14x+49)(x-5)
               f(x) = 0
                                                7,7,5
             f(x) = (x-b)^{m}(1)
f(x) = (x-b)(x-b) --- (x-b)(x-4)(x-7)^{4}
f(x) = (x-2)^{2}(x-5)
f''(x) = (x-2)^{2}(1) + (x-5)(x-2)^{2}
              f''(x) = 3(x-2)^{2} + 6(x-5)(x-2) + 3(x-2)^{2}
            f^{(1)}(x) = 6(x-2)^{2} + 6(x-5)(x-2) + 3(x-2)
f^{(1)}(x) = 12(x-2) + 6[(x-5)(x-2)(1)]
f^{(1)}(2) \neq 0
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Multiple roots

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M=2

Example:

 $\left|\frac{b_1-0}{(b_0-0)}\right| = \left|\frac{0.68198}{1-0}\right| = \lambda < 1$ Take n=0 Here p=0 $\left| \frac{p_2 - 0}{p_1 - 0} \right| = \left| \frac{0.31906 - 0}{0.68198} \right| < 1$ Take n=1 $\left| \frac{p_3 - 0}{p_2 - 0} \right| = \left| \frac{0.16800}{0.31906} \right| < 1$ Take n= 2 $\frac{|b_{n+1}-0|}{(|b_n-0|)!} < 1 \quad \forall n \ge 0$ =) {pn} > p linearly. To check the madratic convergence is d=2 $\left| \frac{b_1 - 0}{(b_0 - 0)^2} \right| = \left| \frac{0.68198}{1} \right| < 1$ Take n=0 ν- 0 $\frac{|P_2 - 0|}{(P_1 - 0)^2} = \frac{|0.31906|}{(0.68198)^2} = 0.68601 < 1$ n 21

$$|b_3-o| \ge \frac{|b_3-o|}{|b_2-o|^2} \ge \frac{|o\cdot|6800|}{|o\cdot319\circ6|^2} = |\cdot65\circ3| > 1$$

$$|b_4-o| = \frac{|o\cdot|6800|}{|o\cdot|6800|^2} \ge 1$$

$$|b_3-o| \ge \frac{|o\cdot|6800|}{|o\cdot|6800|^2} \ge 1$$

$$|b_3-o| \ge \frac{|b_4-o|}{|o\cdot|6800|^2} \ge 1$$

$$|b_4-o| \ge \frac{|b|}{|o\cdot|6800|^2} \ge 1$$

$$|b| \ge \frac{|b|}$$