

4.8 Newton's Method

MATH 205



Roots of Equations

1. Determine the roots of $x^4 - 8x^2 + 12 = 0$
 2. Determine the roots of $e^{2x} - 4e^x + 6x^2 = 0$
- Analytic versus Numeric Methods



Newton's Method

- Newton's Method for approximating roots of a function is an iterative numerical approximation method employing the derivative of the function.
- Select an initial approximation x_0 as close to the root as possible
- Calculate a new approximation using the previous approximation: $n = 0, 1, 2, \dots$
$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$
- Stop when termination conditions are met



Using Newton's Method

3. Determine the zeros of $f(x) = x^5 - 3x^2 - 4x + 1$



Using Newton's Method

4. Find the intersection(s) of $f(x) = e^{2x}$ and $g(x) = x^2$



Using Newton's Method

5. Determine the extrema of

$$f(x) = 2x^7 + 7x^3 - 6x^2 - 9x$$



Using Newton's Method

6. Determine the root of $f(x) = \frac{8x^2}{3x^2 + 1}$ using initial approximations of 1, 0.15 and 1.1