

**Middle East Technical University**  
**Department of Mechanical Engineering**  
**ME 310 – Numerical Methods**  
**Fall 2014**

**Study Problems - 3\***

Assigned on 27.11.2014

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\*Will not be collected/graded.

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1. Employ the following methods to find the maximum of the function given as,

$$f(x) = -x^4 - 2x^3 - 8x^2 - 5x + 48$$

- a) Parabolic Interpolation with  $x_0 = -2$ ,  $x_1 = -1$ ,  $x_2 = 1$  and 4 iterations. Employ new point selection sequence as in the secant method.
- b) Newton's method with initial guess of  $x_0 = -1$  and  $\varepsilon_s = 1\%$

[Adapted from Applied Numerical Methods for Engineers, Steven Chapra]

2. Use least-squares regression to fit

- a) a straight line
- b) a power equation
- c) a saturation-growth-rate equation
- d) a parabola

To the given data below and decide whether any one of the curve fits is superior to others. Justify your reasoning.

$x$	5	10	15	20	25	30	35	40	45	50
$y$	17	24	31	33	37	37	40	40	42	41

[Adapted from Applied Numerical Methods for Engineers, Steven Chapra]

3. Given the data

$x$	1.6	2	2.5	3.2	4	4.5
$f(x)$	2	8	14	15	8	2

Calculate  $f(2.8)$  using Newton's interpolating polynomials of order 1 through 3. Compute the finite divided differences as in Fig. 18.5 of the textbook.

[Adapted from Applied Numerical Methods for Engineers, Steven Chapra]