Prince of Songkla University
Faculty of Engineering

Midterm Test
15 March 2015
215-274 Numerical Methods for Mechanical Engineering

Semester 2/2014
09:00-12:00
Room: Robot

Name _____ ID _____

Direction:
1. All types of calculator and dictionary are permitted.
2. There are totally 5 problems.
3. One sheet of hand-written A4 paper is allowed. No photocopy!!

Perapong Tekasakul
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Instructors

Problem No.	**Full score**	**Your mark**
1	10	
2	10	
3	10	
4	10	
5	10	
Total	**50**	

1. Employ the Newton-Raphson method to determine the root of

$$F(x) = e^{-0.5x}(4-x) - 2$$

Using initial guesses of
(a) 2,
(b) 6, and
(c) 8.

Explain your results. (10 points)

2. (10 points) Use Gauss elimination with partial pivoting to solve:

$$
\begin{aligned}
x_1 - 3x_2 + 2x_3 + x_4 &= -4 \\
2x_1 - 6x_2 + x_3 + 4x_4 &= 1 \\
-x_1 + 2x_2 + 3x_3 + 4x_4 &= 12 \\
- x_2 + x_3 + x_4 &= 0
\end{aligned}
$$

3. Consider the following set of data:

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

Use a second-order polynomial to fit the data. (10 points)

4. Determine $f(4)$ using Newton's interpolating polynomials of order 1 through 4. Choose your base points to attain accuracy. (10 points)

x	$f(x)$
1	3
2	6
3	19
5	99
7	291
8	444

5. Evaluate the integral of the following tabular data with (10 points)
   (a) the trapezoidal rule
   (b) the multiple application Simpson's 1/3 rules

x	$f(x)$
-2	35
0	5
2	-10
4	2
6	5
8	3
10	20