

MAE 8 - Winter 2015

Homework 1

Instructions: Follow the homework solution template. Put all answers in a MATLAB script named **hw1.m**. Submit **hw1.m** through TED before 9 PM on 01/15/2015. Use double precision unless otherwise stated.

Problem 1: Using the elementary functions in MATLAB compute the following:

- a) 9876 raised to the 5^{th} power
- b) 6453 raised to the $1/5^{th}$ power
- c) tangent of π
- d) sine of 45 degrees
- e) the square root of -1
- f) logarithm of 8 using base 2
- g) logarithm of 1000 using base 10
- h) natural logarithm of Euler's number

Problem 2: What is the output of the following expressions?

- a) `char(65)`
- b) `char(87)-char(45)`
- c) `char(0)`
- d) `int32('A')`
- e) `real('A')`
- f) `class('A')`
- g) `r = 'A'<char(0); T=class(r)`

Problem 3: Which of the following are true? Your answer should be logical with 0 for false and 1 for true.

- a) `'A'>= 'a'- 26`
- b) `'g'>= 'k'-5`
- c) `(9 == 2) > 1`
- d) `4\12+4 < 5`
- e) `4/12+4 < 5`
- f) `4 < 7 & 67 > 24`
- g) `5 > 6 || 4 < 5`
- h) `xor(4<4,8>4)`

Problem 4: Use **help elfun** or experiment to answer the following questions. Your answers should be logical variables with 1 for true if the expressions are the same and 0 for false if the expressions are not the same:

- a) Is `fix(3.5)` the same as `floor(3.5)`?
- b) Is `fix(3.4)` the same as `fix(-3.4)`?

- c) Is `fix(3.2)` the same as `floor(3.2)`?
- d) Is `fix(-3.2)` the same as `floor(-3.2)`?
- e) Is `fix(-3.2)` the same as `ceil(-3.2)`?

Problem 5: In the ASCII character encoding, the letters of the alphabet are in order: 'a' comes before 'b' and also 'A' comes before 'B'.

- a) Which comes first - lower or uppercase letters (use strings 'lower' or 'upper' in your response)?
- b) What is the integer offset between 'a' and 'A' (use 32 bit integer type)?
- c) Is the offset in part b) the same for the whole alphabet (logical 0 or 1)?

Problem 6: Explore the **format** command in more detail. Use **help format** to find options. Your answers should be reported as strings (i.e. if the correct format for part a was short your answer would be reported as `p6a='short'`)

- a) Which format will display 12.34567 as 12.35?
- b) What format will display 9.76 as +?
- c) What format will display 1616 as 4099400000000000?
- d) What format will display $5/16 + 2/7$ as 67/112?
- e) What format will display 5678.23221412 as 5678.2?

Problem 7: A vector can be represented by its rectangular coordinates x and y or by its polar coordinates r and θ . The relationship between them is given by the equations:

$$x = r \cos(\theta)$$

$$y = r \sin(\theta)$$

Assign a variable $r = 10$ and a variable $\theta = 84^\circ$. Create expressions to relate variables x , y to variables r and θ .

- a) What is the value of x ?
- b) What is the value of y ?

Problem 8: It is important for engineers and scientists to be able to work with colleagues in different parts of the world. Correct conversion of data from one system of units to another is critically important (for example, from the metric system to the American system or vice versa). Perform the following exercises:

- a) Create a variable `pounds = 10.7` to store a weight in pounds. Write an expression for a variable `kilos` to convert the weight into kilograms. The conversion factor is 1 kilogram = 2.2 pounds. What is the value of `kilos`?
- b) Create a variable `ftemp = 65.2` to store a temperature in degrees Fahrenheit. Write an expression for a variable `ctemp` to convert the temperature into degrees Celsius (C). The conversion factor is $C = (F - 32) * 5/9$. What is the value of `ctemp` ?
- c) Create a variable `miles = 8.0` to store a distance in miles. Write an expression for a variable `km` to convert the distance into kilometers. The conversion factor is 1 mile = 1.6093 kilometers. What is the value of `km` ?