

## Lab 1

1. Evaluate the following MATLAB expressions yourself.

- |                    |                        |                            |
|--------------------|------------------------|----------------------------|
| a. $2 / 2 * 3$     | b. $2 / 3 ^ 2$         | c. $(2 / 3) ^ 2$           |
| d. $2 + 3 * 4 - 4$ | e. $2 ^ 2 * 3 / 4 + 3$ | f. $2 ^ (2 * 3) / (4 + 3)$ |
| g. $2 * 3 + 4$     | h. $2 ^ 3 ^ 2$         | i. $-4 ^ 2$                |

2. Use MATLAB to evaluate the following expressions. The answers are in round brackets again.

- |   |                              |                            |
|---|------------------------------|----------------------------|
| a) $\sqrt{2}$                                       | b) $\frac{3+4}{5+6}$         | c) $2^{3^2}$               |
| d) Find the sum of 5 and 3 divided by their product | e) Find the square of $2\pi$ |                            |
| f) $2\pi^2$   | g) $1/\sqrt{2\pi}$           | h) $\frac{1}{2\sqrt{\pi}}$ |
| i) Find the cube root of the product of 2.3 and 4.5 |                              |                            |

- |  |                             |  |
|--|-----------------------------|--|
| j) $\frac{1 - \frac{2}{3+2}}{1 + \frac{2}{3-2}}$ | k) $1000(1 + 0.15/12)^{60}$ | l) $(0.0000123 + 5.678 \times 10^{-3}) \times 0.4567 \times 10^{-4}$ |
|--|-----------------------------|--|

3. Try to avoid using unnecessary brackets in an expression. Can you spot the errors in the following expression (test your corrected version with MATLAB):

$$(2(3+4))/(5*(6+1))^2$$

4. Set up a vector n with elements 1, 2, 3, 4, 5. Use MATLAB array operations on the vector n to set up the following four vectors, each with five elements:

- |                            |                                    |
|----------------------------|------------------------------------|
| a) 2, 4, 6, 8, 10          | a) $1/2, 1, 3/2, 2, 5/2$           |
| c) $1, 1/2, 1/3, 1/4, 1/5$ | d) $1, 1/2^2, 1/3^2, 1/4^2, 1/5^2$ |

5. Suppose a and b are defined as follows:  $a = [2 \ -1 \ 5 \ 0]$ ;  $b = [3 \ 2 \ -1 \ 4]$ ; Evaluate by hand the vector c in the following statements. Check your answers with MATLAB.

- |                      |                            |                           |
|----------------------|----------------------------|---------------------------|
| a) $c = a - b$ ;     | b) $c = b + a - 3$ ;       | c) $c = 2 * a + a .^ b$ ; |
| d) $c = b ./ a$ ;    | e) $c = b . \setminus a$ ; | f) $c = a .^ b$ ;         |
| g) $c = 2.^ b + a$ ; | h) $c = 2 * b / 3 .* a$ ;  | i) $c = b * 2 .* a$ ;     |

6. Let  $X = [2 \ 5 \ 1 \ 6]$

- |   |   |
|---|---|
| a) Add 16 to each element                   | b) Add 3 to just the odd-index element. |
| c) Compute the square root of each element. | d) Compute the square of each element.  |

7. Given a vector t, of length n, write down the Matlab expressions that will correctly compute the following.

- |                       |                         |                          |              |                              |
|-----------------------|-------------------------|--------------------------|--------------|------------------------------|
| a) $\ln(2 + t + t^2)$ | b) $e^t (1 + \cos(3t))$ | c) $\cos^2 t + \sin^2 t$ | d) $\cot(t)$ | e) $\sec^2(t) + \cot(t) - 1$ |
|-----------------------|-------------------------|--------------------------|--------------|------------------------------|

8. Water freezes at  $32^\circ$  and boils at  $212^\circ$  on the Fahrenheit scale. If C and F are Celsius and Fahrenheit temperatures, the formula  $F = 9C/5 + 32$ , converts from Celsius to Fahrenheit. Use

the MATLAB command line to convert a temperature of 37°C (normal human temperature) to Fahrenheit (98.6°).

9. Engineers often have to convert from one unit of measurement to another; this can be tricky sometimes. You need to think through the process carefully. For example, convert 5 acres to hectares, given that an acre is 4840 square yards, a yard is 36 inches, an inch is 2.54 cm, and a hectare is 10000 m<sup>2</sup>.