

ME 1020 Engineering Programming with MATLAB

Handout 04a

Homework 4a Assignment: 4.5, 4.7, 4.9, 4.10, 4.11, 4.18

Section 4.2

4.* Suppose that $x = 6$. Find the results of the following operations by hand and use MATLAB to check your results.

- a. $z = (x < 10)$
- b. $z = (x == 10)$
- c. $z = (x >= 4)$
- d. $z = (x \sim= 7)$

5.* Find the results of the following operations by hand and use MATLAB to check your results.

- a. $z = 6 > 3 + 8$
- b. $z = 6 + 3 > 8$
- c. $z = 4 > (2 + 9)$
- d. $z = (4 < 7) + 3$
- e. $z = 4 < 7 + 3$
- f. $z = (4 < 7) * 5$
- g. $z = 4 < (7 * 5)$
- h. $z = 2 / 5 >= 5$

6.* Suppose that $x = [10, -2, 6, 5, -3]$ and $y = [9, -3, 2, 5, -1]$. Find the results of the following operations by hand and use MATLAB to check your results.

- a. $z = (x < 6)$
- b. $z = (x <= y)$
- c. $z = (x == y)$
- d. $z = (x \sim= y)$

7. For the arrays x and y given below, use MATLAB to find all the elements in x that are greater than the corresponding elements in y .

$$x = [-3, 0, 0, 2, 6, 8] \quad y = [-5, -2, 0, 3, 4, 10]$$

8. The array `price` given below contains the price in dollars of a certain stock over 10 days. Use MATLAB to determine how many days the price was above \$20.

$$\text{price} = [19, 18, 22, 21, 25, 19, 17, 21, 27, 29]$$

9. The arrays `price_A` and `price_B` given below contain the price in dollars of two stocks over 10 days. Use MATLAB to determine how many days the price of stock A was above the price of stock B.

$$\text{price_A} = [19, 18, 22, 21, 25, 19, 17, 21, 27, 29]$$

$$\text{price_B} = [22, 17, 20, 19, 24, 18, 16, 25, 28, 27]$$

10. The arrays `price_A`, `price_B`, and `price_C` given below contain the price in dollars of three stocks over 10 days.

- a. Use MATLAB to determine how many days the price of stock A was above both the price of stock B and the price of stock C.

- b. Use MATLAB to determine how many days the price of stock A was above either the price of stock B or the price of stock C.
- c. Use MATLAB to determine how many days the price of stock A was above either the price of stock B or the price of stock C, but not both.

```
price_A = [19, 18, 22, 21, 25, 19, 17, 21, 27, 29]
price_B = [22, 17, 20, 19, 24, 18, 16, 25, 28, 27]
price_C = [17, 13, 22, 23, 19, 17, 20, 21, 24, 28]
```

Section 4.3

- 11.* Suppose that $x = [-3, 0, 0, 2, 5, 8]$ and $y = [-5, -2, 0, 3, 4, 10]$. Find the results of the following operations by hand and use MATLAB to check your results.

- a. $z = y < \sim x$
- b. $z = x \& y$
- c. $z = x | y$
- d. $z = \text{xor}(x, y)$

12. The height and speed of a projectile (such as a thrown ball) launched with a speed of v_0 at an angle A to the horizontal are given by

$$h(t) = v_0 t \sin A - 0.5 g t^2$$

$$v(t) = \sqrt{v_0^2 - 2v_0 g t \sin A + g^2 t^2}$$

where g is the acceleration due to gravity. The projectile will strike the ground when $h(t) = 0$, which gives the time to hit $t_{\text{hit}} = 2(v_0/g) \sin A$.

Suppose that $A = 30^\circ$, $v_0 = 40$ m/s, and $g = 9.81$ m/s². Use the MATLAB relational and logical operators to find the times when

- a. The height is no less than 15 m.
- b. The height is no less than 15 m and the speed is simultaneously no greater than 36 m/s.
- c. The height is less than 5 m or the speed is greater than 35 m/s.
- 13.* The price, in dollars, of a certain stock over a 10-day period is given in the following array.

```
price = [19, 18, 22, 21, 25, 19, 17, 21, 27, 29]
```

Suppose you owned 1000 shares at the start of the 10-day period, and you bought 100 shares every day the price was below \$20 and sold 100 shares every day the price was above \$25. Use MATLAB to compute (a) the amount you spent in buying shares, (b) the amount you received from the sale of shares, (c) the total number of shares you own after the 10th day, and (d) the net increase in the worth of your portfolio.

14. Let e_1 and e_2 be logical expressions. DeMorgan's laws for logical expressions state that
- NOT(e_1 AND e_2) implies that (NOT e_1) OR (NOT e_2)
and
NOT(e_1 OR e_2) implies that (NOT e_1) AND (NOT e_2)
- Use these laws to find an equivalent expression for each of the following expressions and use MATLAB to verify the equivalence.
- $\sim((x < 10) \& (x \geq 6))$
 - $\sim((x == 2) | (x > 5))$
15. Are these following expressions equivalent? Use MATLAB to check your answer for specific values of a , b , c , and d .
1. $(a == b) \& ((b == c) | (a == c))$
2. $(a == b) | ((b == c) \& (a == c))$
 1. $(a < b) \& ((a > c) | (a > d))$
2. $(a < b) \& (a > c) | ((a < b) \& (a > d))$
16. Write a script file using conditional statements to evaluate the following function, assuming that the scalar variable x has a value. The function is $y = e^{x+1}$ for $x < -1$, $y = 2 + \cos(\pi x)$ for $-1 \leq x < 5$, and $y = 10(x - 5) + 1$ for $x \geq 5$. Use your file to evaluate y for $x = -5$, $x = 3$, and $x = 15$, and check the results by hand.

Section 4.4

17. Rewrite the following statements to use only one `if` statement.

```
if x < y
    if z < 10
        w = x*y*z
    end
end
```

18. Write a program that accepts a numerical value x from 0 to 100 as input and computes and displays the corresponding letter grade given by the following table.

- $x \geq 90$
- $80 \leq x \leq 89$
- $70 \leq x \leq 79$
- $60 \leq x \leq 69$
- $x < 60$