ME 1020 Engineering Programming with MATLAB

Chapter 4a Homework Solutions: 4.3, 4.5, 4.7, 4.9, 4.10, 4.11, 4.13, 4.18, 4.21

Problem 4.3:

3. It is desired to compute the sum of the first 10 terms of the series $14k^3 - 20k^2 + 5k, k = 1, 2, 3, \ldots$

a. Develop a pseudocode description of the required program.

b. Write and run the program described in part *a*.

```
% Problem 4.3
clear
clc
disp('Problem 4.3: Scott Thomas')

total = 0;
for k = 1:10
    total = total + 14*k^3 - 20*k^2 + 5*k;
end
total
```

```
Problem 4.3: Scott Thomas

total =

       34925
```

Problem 4.5:

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`

```
% Problem 4.5
clear
clc
disp('Problem 4.5: Scott Thomas')

disp('Part a: z = 6 > 3 + 8 (greater than?)')
z = 6 > 3 + 8

disp('Part b: z = 6 + 3 > 8 (greater than?)')
z = 6 + 3 > 8

disp('Part c: z = 4 > (2+9) (greater than?)')
z = 4 > (2+9)

disp('Part d: z = (4<7) + 3 (less than?)')
z = (4<7) + 3

disp('Part e: z = 4<7+3 (less than?)')
z = 4<7+3

disp('Part f: z = (4<7)*5 (less than?)')
z = (4<7)*5

disp('Part g: z = 4<(7*5) (less than?)')
z = 4<(7*5)

disp('Part h: z = 2/5>=5 (greater than?)')
z = 2/5>=5
```

Problem 4.5: Scott Thomas
Part a: z = 6 > 3 + 8 (greater than?)

z =

0

Part b: z = 6 + 3 > 8 (greater than?)

z =

1

Part c: z = 4 > (2+9) (greater than?)

z =

0

Part d: z = (4<7) + 3 (less than?)

z =

4

Part e: z = 4<7+3 (less than?)

z =

1

Part f: z = (4<7)*5 (less than?)

z =

5

Part g: z = 4<(7*5) (less than?)

z =

1

Part h: z = 2/5>=5 (greater than?)

z =

0

Problem 4.7:

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]` `y = [-5, -2, 0, 3, 4, 10]`

```
% Problem 4.7
clear
clc
disp('Problem 4.7: Scott Thomas')

x = [-3 0 0 2 6 8]
y = [-5 -2 0 3 4 10]

z = x > y

for k = 1:6
    z(k) = x(k) > y(k);
end

z
```

```
Problem 4.7: Scott Thomas

x =

    -3     0     0     2     6     8


y =

    -5    -2     0     3     4    10


z =

     1     1     0     0     1     0


z =

     1     1     0     0     1     0
```

Problem 4.9:

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.

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

```
% Problem 4.9
clear
clc
disp('Problem 4.9: Scott Thomas')

price_A = [19 18 22 21 25 19 17 21 27 29]

price_B = [22 17 20 19 24 18 16 25 28 27]

z = price_A > price_B

zz = find(price_A > price_B)

number_of_days = length(zz)
```

Problem 4.9: Scott Thomas

price_A =

19 18 22 21 25 19 17 21 27 29

price_B =

22 17 20 19 24 18 16 25 28 27

z =

0 1 1 1 1 1 1 0 0 1

zz =

2 3 4 5 6 7 10

number_of_days =

7

Problem 4.10:

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]
```

```
% Problem 4.10
clear
clc
disp('Problem 4.10: Scott Thomas')

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]

disp('Part a:')
zza = find((price_A > price_B) & (price_A > price_C))
number_of_days = length(zza)
disp('Part b:')
zzb = find((price_A > price_B) | (price_A > price_C))
number_of_days = length(zzb)
disp('Part c:')
zzc = find(xor((price_A > price_B) , (price_A > price_C)))
number_of_days = length(zzc)
```

Problem 4.10: Scott Thomas

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

Part a:

zza =

2 5 6 10

number_of_days =

4

Part b:

zzb =

1 2 3 4 5 6 7 9 10

number_of_days =

9

Part c:

zzc =

1 3 4 7 9

number_of_days =

5

Problem 4.11:

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 < ~x`

b. `z = x & y`

c. `z = x|y`

d. `z = xor(x,y)`

```
% Problem 4.11
clear
clc
disp('Problem 4.11: Scott Thomas')

x = [-3 0 0 2 5 8]

not_x = ~x

y = [-5 -2 0 3 4 10]


disp('Part a: z = y < ~x')
z = y < ~x

disp('Part b: z = x & y')
z = x & y

disp('Part c: z = x | y')
z = x | y

disp('Part d: z = xor(x,y)')
z = xor(x,y)
```

```
Problem 4.11: Scott Thomas

x =

    -3     0     0     2     5     8


not_x =

     0     1     1     0     0     0


y =

    -5    -2     0     3     4    10

Part a: z = y < ~x

z =

     1     1     1     0     0     0
```

```
Part b: z = x & y

z =

     1     0     0     1     1     1

Part c: z = x | y

z =

     1     1     0     1     1     1

Part d: z = xor(x,y)

z =

     0     1     0     0     0     0
```

Problem 4.13:

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.

```
% Problem 4.13
clear
clc
disp('Problem 4.13: Scott Thomas')

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

initial_shares = 1000;

disp('Part (a): amount spent buying shares')

bought_shares = 100*sum(price<20)
cost_bought_shares = 100*sum(price.*(price<20))

disp('Part (b): amount received selling shares')

sold_shares = 100*sum(price>25)
income_sold_shares = 100*sum(price.*(price>25))

disp('Part (c): number of shares after 10th day')

number_shares_day10 = initial_shares + bought_shares - sold_shares

disp('Part (d): increase in value of portfolio')

value_increase = price(10)*number_shares_day10 - price(1)*initial_shares
```

```
Problem 4.13: Scott Thomas

price =

    19    18    22    21    25    19    17    21    27    29

Part (a): amount spent buying shares

bought_shares =

   400


cost_bought_shares =

        7300
```

```
Part (b): amount received selling shares

sold_shares =

   200


income_sold_shares =

        5600

Part (c): number of shares after 10th day

number_shares_day10 =

        1200

Part (d): increase in value of portfolio

value_increase =

       15800
```

Problem 4.18:

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.

A $x \geq 90$
B $80 \leq x \leq 89$
C $70 \leq x \leq 79$
D $60 \leq x \leq 69$
F $x < 60$

a. Use nested `if` statements in your program (do not use `elseif`).
b. Use only `elseif` clauses in your program.

```
% Problem 4.18a
clear
clc
disp('Problem 4.18a: Scott Thomas')

grade = input('Input Grade: ')

if grade>=90
    Grade = 'A'
end

it grade >=80 & grade<90
    Grade = 'B'
end

if grade >=70 & grade<80
    Grade = 'C'
end

if grade >=60 & grade<70
    Grade = 'D'
end

it grade <60
    Grade = 'F'
end
```

```
Problem 4.18a: Scott Thomas
Input Grade: 87

grade =

    87


Grade =

B

>>
```

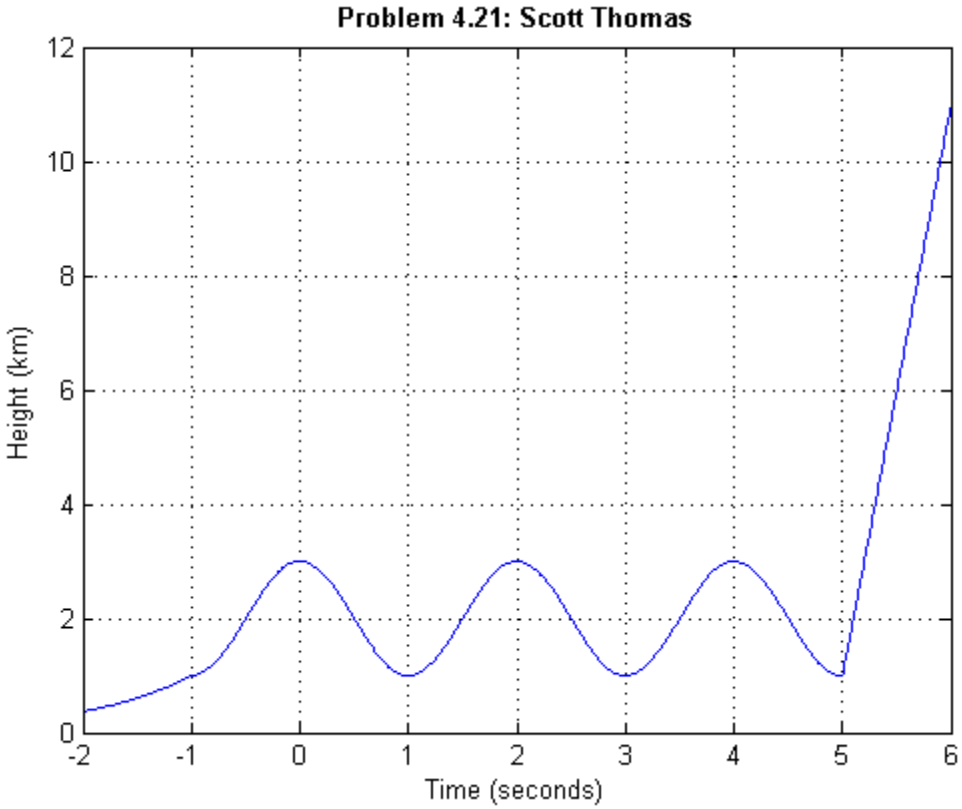
```
% Problem 4.18b
clear
clc
disp('Problem 4.18b: Scott Thomas')

grade = input('Input Grade: ')

if grade>=90
    Grade = 'A'
elseif grade >= 80 & grade <90
       Grade = 'B'
elseif grade >= 70 & grade <80
       Grade = 'C'
elseif grade >= 60 & grade <70
       Grade = 'D'
else
       Grade = 'F'
end
```

```
Problem 4.18b: Scott Thomas
Input Grade: 97

grade =

    97


Grade =

A

>>
```

Problem 4.21:

21. Use a `for` loop to plot the function given in Problem 16 over the interval $-2 \leq x \leq 6$. Properly label the plot. The variable y represents height in kilometers, and the variable x represents time in seconds.

```
% Problem 4.21
clear
clc
disp('Problem 4.21: Scott Thomas')

N = 1000; % Number of evaluated points
x = linspace(-2,6,N); %N

for k = 1:N

if x(k)<(-1)
    y(k) = exp(x(k)+1);
elseif x(k) >=-1 & x(k)<5
    y(k) = 2+cos(pi*x(k));
else
    y(k) = 10*(x(k) - 5)+1;
end

end

plot(x,y),xlabel('Time (seconds)'), ylabel('Height (km)'), grid on
title('Problem 4.21: Scott Thomas','FontWeight','bold')
```


Problem 4.21: Scott Thomas
Height (km)
Time (seconds)
0
2
4
6
8
10
12
-2
-1
0
1
2
3
4
5
6