Exam Programming in MATLAB

Docenten: Dr. H. M. Cuppen and Prof. dr. ir. G. C. Groenenboom

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Problem 1 Matlab basics

a) The function calculates the absolute value of the input vector. `absolute` would be a better name with the following help-function on line 2:

```
1 %ABSOLUTE returns the absolute value of vector x
```

(10 points)

b) (1)
```
a = 0
    0
    0
    0
    0
```
(2) `a = 1 2 3 4 5`

(3) `error 'x is not a vector'`

(9 points)

c) replace 8 for : `for n=1:length(x)`, remove lines 7 an 14 (10 points)

d) Remove lines 3–5
replace 7–15 by:

```
M = X;
l = find (X<0);
M(l) = -M(l);
```

I use capitals for matrices: `function M = absolute(X)` (11 points)

e)

initial `a`	`a`	`b`	`c`
1	3	6	4
2	4	5	4
2.5	4.5	5	4.5
3	3	5	5
4	4	5	6

(10 points)

Problem 2 Improve the code

a) line 1: syntax `(y,i)` $\longrightarrow$ `[y,i]`
line 6: runtime on 7 `0:length` $\longrightarrow$ `2:length`
line 7: logic `>` $\longrightarrow$ `<`
line 8: logic `Y` $\longrightarrow$ `y`
line 9: logic `==` $\longrightarrow$ `=`
line 11: syntax/runtime missing `end`
(6×3=18 points)

b) (i) all dot operations can be removed
(ii) remove line 2–12

```
function [dCdT] = diffeqs(C,k)
  dCdT=[-k(1).*C(1).*C(2) -k(2).*C(1).*C(3) + k(3).*C(4).*C(2);
   -k(3).*C(2).*C(4) + k(2).*C(3).*C(1) - k(1).*C(2).*C(1);
   k(1).*C(1).*C(2) - k(2).*C(1).*C(3);
   -k(3).*C(2).*C(4) + k(1).*C(1).*C(2)];
```

(12 points)

Problem 3 Solving a problem

a) Each compound requires 4 fitting parameters: γ, B_3, B_5, and B_7. Typically one needs one more point than the number of parameters (5), but since the highest power is 7, it would better to have 8 points at least to fit this. (6 points)

b)

```
  data = load('data.dat');
  gamma = zeros(3,1);
  T = data(:,1);
  X = [T T.^3 T.^5 T.^7];
  for i=1:3
    C = data(:,i+1);
    b = X\C;
    gamma(i) = b(1);
  end
```

(14 points)