School of Mathematics and Statistics
MAST30013
Techniques in Operations Research

Semester 1, 2020

Tutorial on Matlab

1. a: From the same directory as the function is, call, for example > mymax(1,2,3,4,5).

1. b:

```
function min = mymin(n1, n2, n3, n4, n5)
%This function calculates the minimum of the five numbers given as input

min =  n1;
if(n2 < min)
    min = n2;
end
if(n3 < min)
   min = n3;
end
if(n4 < min)
    min = n4;
end
if(n5 < min)
    min = n5;
end
```

1. c:

```
function [first, second] = mytwomin(n1, n2, n3, n4, n5)
%This function returns the two numbers yielding the minimum product

values = [n1,n2,n3,n4,n5];
first = n1;
second = n2;
product = n1*n2;

for i=1:5
    for j=i:5
        if values(i)*values(j) < product;
            first = values(i);
            second = values(j);
            product = values(i)*values(j);
        end
    end
end
```

2.

a)

```
function val = fx(x)
val = cos(x)/x;
```

b)

```
function val = fx(x)
val = -sin(x)/x -cos(x)/x^2 ;
```

c)

```
function val = f(x)

function val = fx(x)
    val = cos(x)/x;
end

function val = fprime(x)
    val = -sin(x)/x -cos(x)/x^2 ;
end


val = fx(x)/fprimex(x);

end
```

3. Let $f(x, y) = x^2 + 2x + y$

a)

```
function val = f(x,y)
val = x^2+2*x+y;
```

b)

```
function grad = gradF(x,y)
grad(1) = 2*x + 2;
grad(2) = 1;
```

c)

```
function hess = hessF(x,y)
hess(1,1) = 2;
hess(1,2) = 0;
hess(2,1) = 0;
hess(2,2) = 0;
```

```
%Question 2
%Define one variable
syms x;
%Define a function of the variable
f = cos(x)./x;
p = diff(f);
q = f./p;
%Evaluate at a particular point x = 1
x = 1;
subs(f) % return result in terms of cos(1), sin(1)
%Alternatively, subs(f,{x},{1})
double(subs(f)) % numerical result
subs(p)
subs(q)

%Question 3
%Define two variables
syms x y;
%Define a function of the variables
f = x.^2+2.*x+y;
%Calculate the gradient and hessian
g = gradient(f,[x,y]);
h = hessian(f,[x,y]);

%Evaluate at a particular point (x,y) = (1,0)
x = 1; y = 0;
subs(f)
subs(g)
subs(h)
```