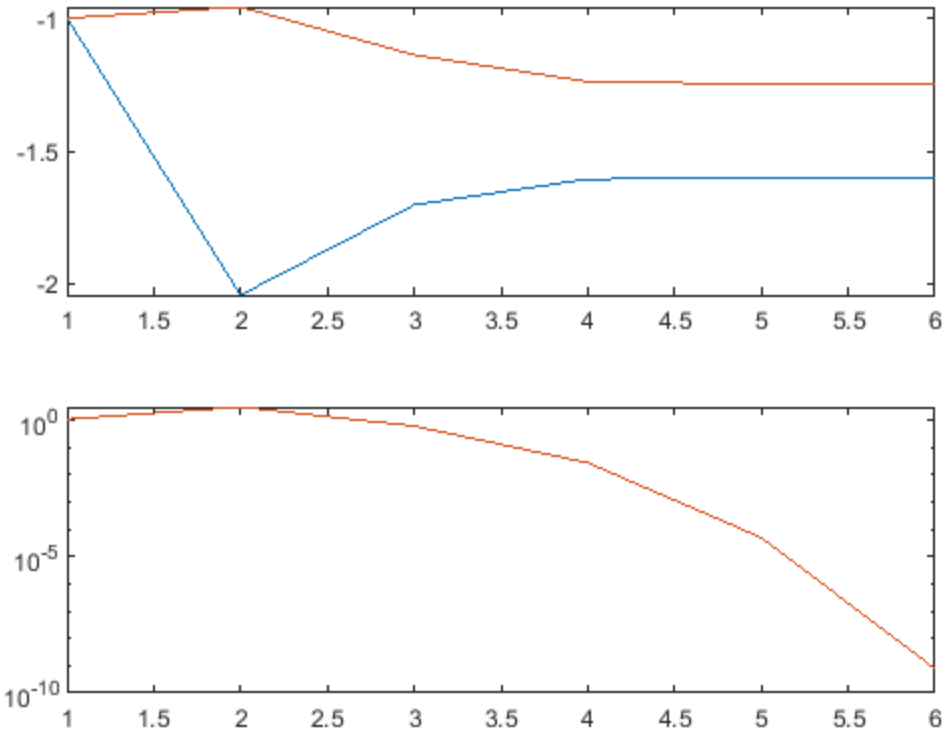
Table of Contents

1a)

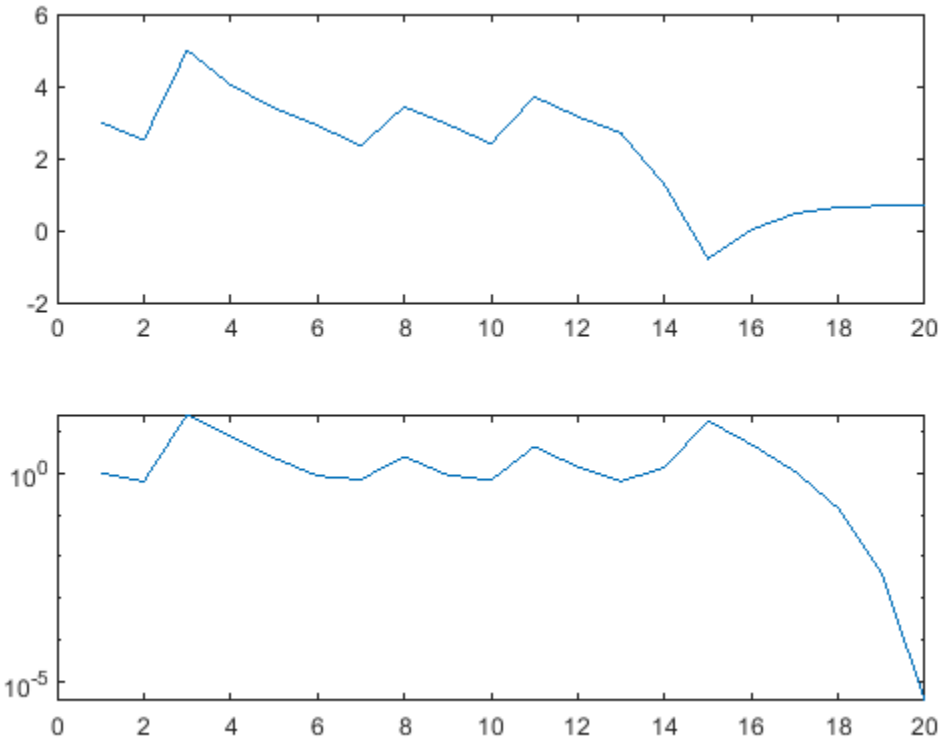
```
close all;
clear;
clc;
x0 = -1;
y0 = -1;

initial_value = [x0;y0];
syms x y;

jac_a(x,y) = jacobian(func1(x,y), [x y]);
sol = NewtonsMethodTemplate(@func1, jac_a, initial_value, 1e-7);

iterations = 1:size(sol, 2);
iters = size(sol,2);
vals = zeros(size(initial_value, 1), iters);
for k = 1:iters
    cell = num2cell(sol(:,k));
    value = func1(cell{:});
    vals(:,k) = norm(value, Inf);
end
subplot(211)
plot(iterations, sol);
subplot(212)
semilogy(iterations, vals);
```



1b

```
close all;
clear;
clc;


func_b = @(x) (x-1)*(x-2)*(x-3)+1;
syms x;
jac_b(x) = jacobian(func_b(x), x);
disp(simplify(jac_b));
x0 = 3;
sol = NewtonsMethodTemplate(func_b, simplify(jac_b), x0, 1e-4, 100);

iterations = 1:size(sol, 2);
iters = size(sol,2);
vals = zeros(size(x0, 1), iters);
for k = 1:iters
     value = func_b(sol(:, k));
    vals(:,k) = norm(value, Inf);
end
subplot(211)
plot(iterations, sol);
subplot(212)
semilogy(iterations, vals);
```

```
3*x^2 - 12*x + 11
symbolic function inputs: x
```

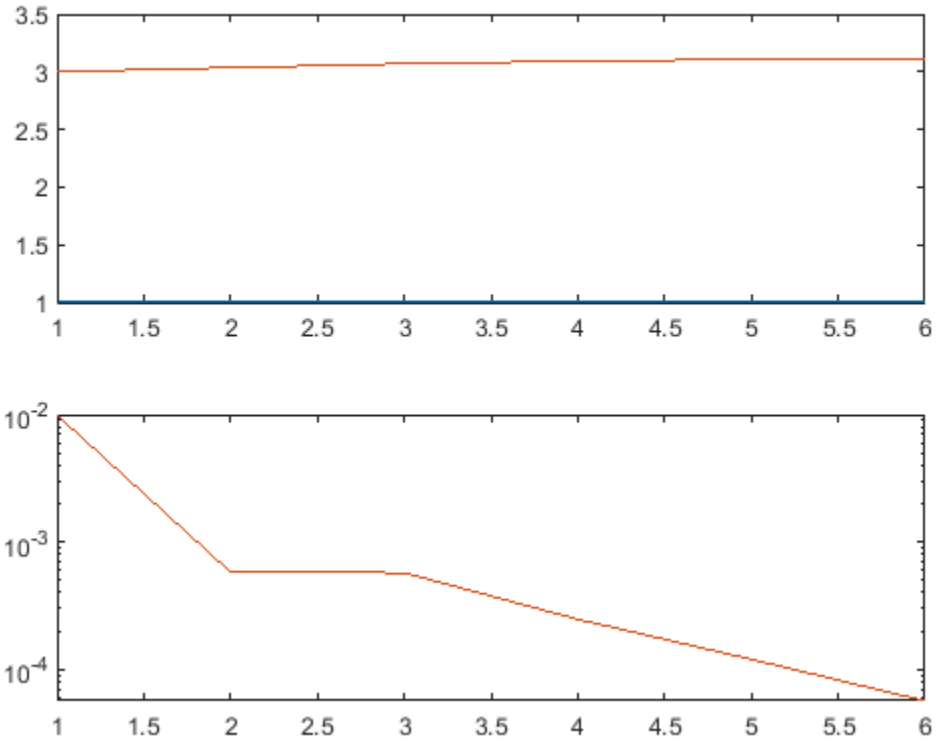


1c)

```
close all;
clear;
clc;
func_c = @(x, y) [x-1 + (cos(y)*x+1)*cos(y);
                  -x*sin(y)*(cos(y)*x+1)];
syms x1 x2;
jac_c(x1, x2) = jacobian(func_c(x1, x2), [x1, x2]);
disp(simplify(jac_c));
x0 = [1; 3];
sol = NewtonsMethodTemplate(func_c, simplify(jac_c), x0, 1e-4, 50);

iterations = 1:size(sol, 2);
iters = size(sol,2);
vals = zeros(size(x0, 1), iters);
for k = 1:iters
    cell = num2cell(sol(:, k));
     value = func_c(cell{:});
    vals(:,k) = norm(value, Inf);
end
subplot(211)
```

```
plot(iterations, sol);
subplot(212)
semilogy(iterations, vals);
```

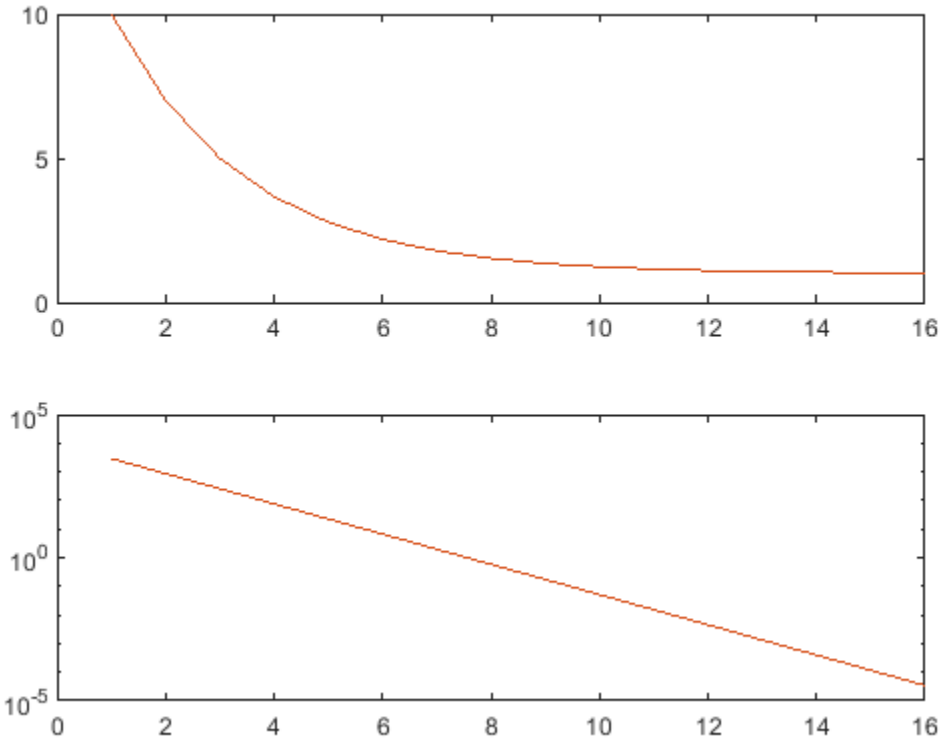
```
[               cos(x2)^2 + 1,          -sin(x2)*(2*x1*cos(x2) + 1)]
[ -sin(x2)*(2*x1*cos(x2) + 1), -x1*(cos(x2) - x1 + 2*x1*cos(x2)^2)]
symbolic function inputs: x1, x2
```



1d

```
close all;
clear;
clc;
func_d = @(x) 100*(x(2)-x(1))^2+(x(1)-1)^4;
syms x1 x2;
grad_d(x1,x2) = jacobian(func_d([x1;x2]), [x1, x2])';

jac_grad_d(x1, x2) = jacobian(grad_d(x1,x2), [x1, x2]);

x0 = [10;10];
sol = NewtonsMethodTemplate(grad_d, simplify(jac_grad_d), x0, 1e-4,
 100);

iterations = 1:size(sol, 2);
iters = size(sol,2);
```

```
vals = zeros(size(x0, 1), iters);
for k = 1:iters
    cell = num2cell(sol(:,k));
     value = grad_d(cell{:});
    vals(:,k) = norm(value, Inf);
end
subplot(211)
plot(iterations, sol(1,:));
hold on;
plot(iterations, sol(2,:));

subplot(212)
semilogy(iterations, vals);
```



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