

Solving system equations using MATLAB

```
% define circuit variable symbols
syms I1 I2 I3

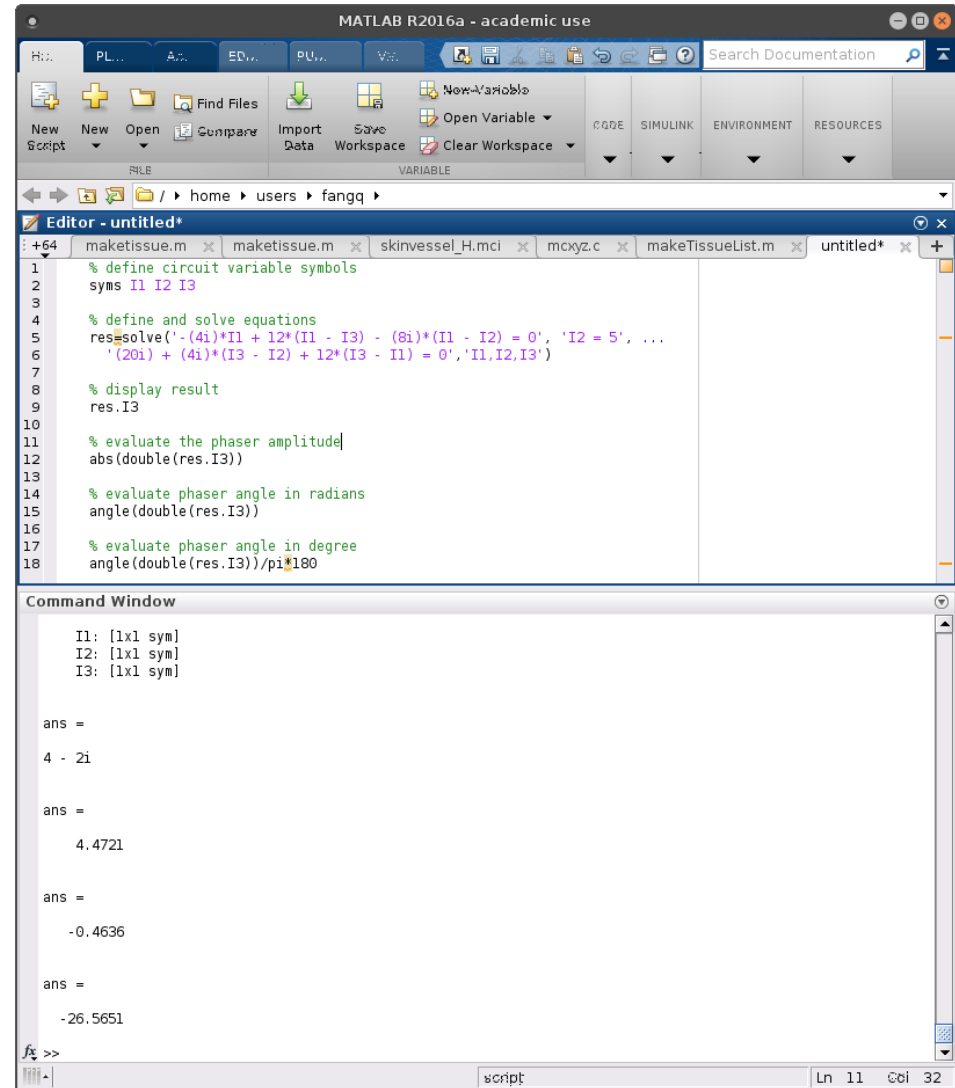
% define and solve equations
res=solve('-(4i)*I1 + 12*(I1 - I3) - (8i)*(I1 - I2) = 0', 'I2 = 5', ...
    '(20i) + (4i)*(I3 - I2) + 12*(I3 - I1) = 0','I1,I2,I3')

% display result
res.I3

% evaluate the phaser amplitude
abs(double(res.I3))

% evaluate phaser angle in radians
angle(double(res.I3))

% evaluate phaser angle in degree
angle(double(res.I3))/pi*180
```



The screenshot shows the MATLAB R2016a interface. The Editor window displays the following code:

```
1 % define circuit variable symbols
2 syms I1 I2 I3
3
4 % define and solve equations
5 res=solve('-(4i)*I1 + 12*(I1 - I3) - (8i)*(I1 - I2) = 0', 'I2 = 5', ...
6 '(20i) + (4i)*(I3 - I2) + 12*(I3 - I1) = 0','I1,I2,I3')
7
8 % display result
9 res.I3
10
11 % evaluate the phaser amplitude
12 abs(double(res.I3))
13
14 % evaluate phaser angle in radians
15 angle(double(res.I3))
16
17 % evaluate phaser angle in degree
18 angle(double(res.I3))/pi*180
```

The Command Window shows the output of the script:

```
I1: [1x1 sym]
I2: [1x1 sym]
I3: [1x1 sym]

ans =

4 - 2i

ans =

4.4721

ans =

-0.4636

ans =

-26.5651

f1 >>
```

The status bar at the bottom indicates the current file is 'script' and the cursor is at line 11, column 32.

Solving system equations using Mathematica

<http://wolfram.com>

```
(* Define and solve complex system equations, use symbols (I1,I2,I3 directly), complex unit is I *)
```

```
res=Solve[{-4 I*I1 + 12*(I1 - I3) - 8 I*(I1 - I2) == 0, I2 == 5, 20 I + 4 I*(I3 - I2) + 12*(I3 - I1) == 0}, {I1, I2, I3}]
```

```
(*Evaluate the numerical values of the solution (res is the symbolic results in a "List" form) *)
```

```
N[res]
```

```
(*Evaluate the phaser amplitude*)
```

```
Abs[I3/.res]//N
```

```
(*Evaluate the phaser angle in radians*)
```

```
Arg[I3/.res]//N
```

```
(*Evaluate phaser angle in degree*)
```

```
Arg[I3/.res]/Degree//N
```

The screenshot shows the Wolfram Mathematica Online interface. The browser address bar displays the URL: <https://mathematica.wolframcloud.com/app/objects/febcb88a7-bbc4-4762...>. The page title is "WOLFRAM MATHEMATICA ONLINE" and the site is identified as "Plan: Site (Northeastern University)".

The input text in the Mathematica interface is: `Define and solve complex system equations, use symbols (I1,I2,I3 directly), complex unit is I`
`In[7]:= res = Solve[{-4 I*I1 + 12*(I1 - I3) - 8 I*(I1 - I2) == 0, I2 == 5, 20 I + 4 I*(I3 - I2) + 12*(I3 - I1) == 0}, {I1, I2, I3}]`

The output is: `Out[7]:= {{I1 -> 14/3 - 2 I/3, I2 -> 5, I3 -> 4 - 2 I}}`

The input text for the next step is: `Evaluate the numerical values of the solution (res is the symbolic results in a "List" form)`
`In[8]:= N[res]`

The output is: `Out[8]:= {{I1 -> 4.66667 - 0.666667 I, I2 -> 5., I3 -> 4. - 2. I}}`

The input text for the next step is: `Evaluate the phaser amplitude`
`In[9]:= Abs[I3 /. res] // N`

The output is: `Out[9]:= {4.47214}`

The input text for the next step is: `Evaluate the phaser angle in radians`
`In[10]:= Arg[I3 /. res] // N`

The output is: `Out[10]:= {-0.463648}`

The input text for the next step is: `Evaluate phaser angle in degree`
`In[11]:= Arg[I3 /. res] / Degree // N`

The output is: `Out[11]:= {-26.5651}`