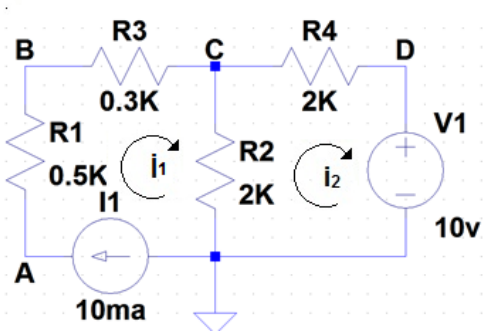
EE 210
Mesh Example

Find the value of the mesh currents i_1 and i_2.
By inspection
$i_1 = 10$.



For mesh 2
$-2(i_2 - i_1) - 2i_2 - 10 = 0$
or
$2i_1 - 4i_2 = 10$
Substituting $i_1 = 10$ we get
$-4i_2 = -10$
or $i_2 = 2.5$ma

1. Use mesh analysis to determine the value of voltage at node B and the value of the current i_0.

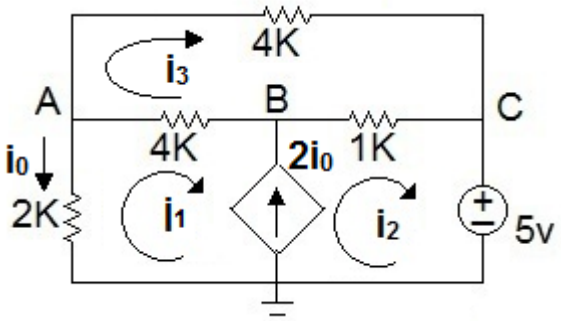
Mesh 3:

$-4i_3 - 1(i_3 - i_2) - 4(i_3 - i_1) = 0$

or

$4i_1 + i_2 - 9i_3 = 0$ (1)

Cannot do mesh 1 and mesh 2 because of the current source



Create a supermesh with current i

$-2i_1 - 4(i_1 - i_3) - 1(i_2 - i_3) - 5 = 0$

or

$-6i_1 - i_2 + 5i_3 = 5$ (2)

We have two equations and 3 unknowns

We know that the current in the dependent current source is $2i_0$ and we know that $i_0 = -i_1$

$i_2 - i_1 = 2i_0 = -2i_1$

or

$-i_1 - i_2 = 0$ (3)

In matrix form we have

$$\begin{bmatrix} 4 & 1 & -9 \\ -6 & -1 & 5 \\ -1 & -1 & 0 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 5 \\ 0 \end{bmatrix}$$

In MATLAB® we have

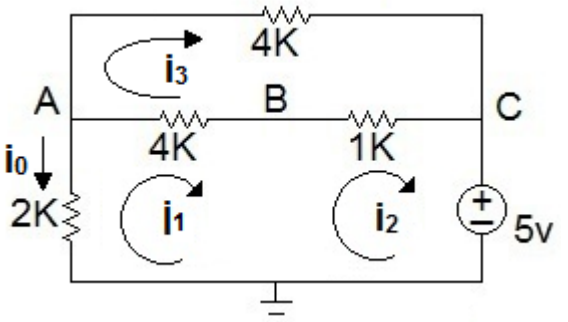
```
%MeshExmp.m
A = [4 1 -9;...
     -6 -1 5;...
     -1 -1 0];
b = [0; 5; 0];
x = A^-1*b;
disp(x);
```

which gives

-1.5000
1.5000
-0.5000

So $i_0 = i_1 = -1.5$ ma.

The voltage at node C is +5 volts.



We can get the voltage at node B from

$V_B = 1(i_2 - i_3) + 5 = 1(1.5 - (-0.5)) + 5 = 7$ volts