

Figure below shows a 3-loop circuit, the loop currents are defined as  $I_1$ ,  $I_2$  and  $I_3$ , respectively.

(a) Write down the KVL equations of all loops, in terms of loop current  $I_1$ ,  $I_2$  and  $I_3$ .

Use the following operators: + (add), - (subtract), \* (multiply), / (divide), = (equate).

(b) Based on the equations you got from part (a), solve the loop currents to determine the values of  $I_1$ ,  $I_2$  and  $I_3$ .

**Show your calculations.**

Part (a):

$$\text{Loop 1: } 12 - 1*(I_1 - I_2) - 2*(I_1 - I_3) = 0$$

$$\text{Loop 2: } 1*(I_2 - I_1) + 2*I_2 + 3*(I_2 - I_3) = 0$$

$$\text{Loop 3: } 2*(I_3 - I_1) + 3*(I_3 - I_2) + 4*I_3 + 9 = 0$$

Part (b):

From part (a)

$$3*I_1 - I_2 - 2*I_3 = 12 \quad (1)$$

$$I_1 - 6*I_2 + 3*I_3 = 0 \quad (2)$$

$$2*I_1 + 3*I_2 - 9*I_3 = 9 \quad (3)$$

$$(1)-3*(2): 17*I_2 - 11*I_3 = 12 \quad (4);$$

$$(3)-2*(2): 5*I_2 - 5*I_3 = 3 \quad (5);$$

From (4) & (5),  $I_2=0.9\text{A}$ ,  $I_3=0.3\text{A}$  into (2)  $I_1= 4.5 \text{ A}$

