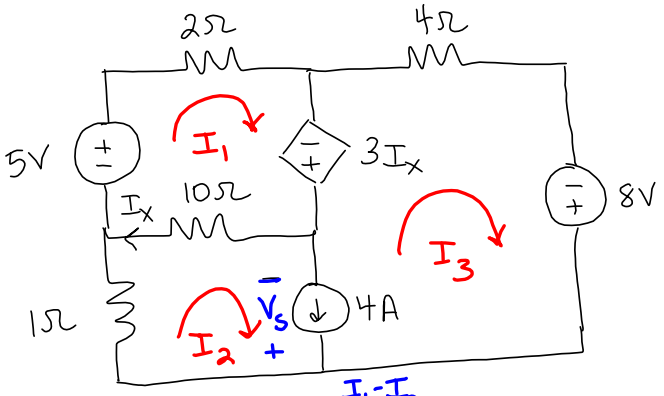
Exam 1 => Wednesday, Feb 12th

Covers everything superposition => No Brute Force

Bring: pencils, erasers, calculator (fresh batteries)

3" x 5" sheet of notes : handwritten; any two sides

3-4 problems



Find I_x using mesh

Know

$I_x = I_1 - I_2$

$I_2 - I_3 = 4$

m1: $5 - 2I_1 + 3I_x - 10(I_1 - I_2) = 0$ ($I_x = I_1 - I_2$)

m2: $-1I_2 - 10(I_2 - I_1) + V_s = 0$ (active)

$1I_2 + 10(I_2 - I_1) - V_s = 0$ (passive)

m3: $-4I_3 + 8 - V_s - 3I_x = 0$ ($I_x = I_1 - I_2$)

m1: $-9I_1 + 7I_2 = -5$

m2: $-I_2 - 10(I_2 - I_1) - 4I_3 + 8 - 3(I_1 - I_2) = 0$

$7I_1 - 8I_2 - 4I_3 = -8$

$I_2 - I_3 = 4$

$I_1 = 3.86A$

$I_2 = 4.25A$

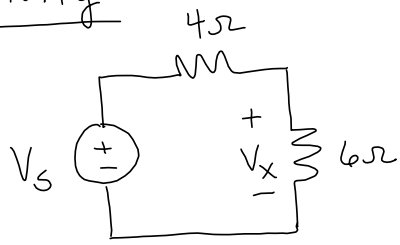
$I_3 = 0.25A$

$I_x = -0.39A$

Superposition

ckts that are linear — additivity, homogeniety

Additivity



$$V_x = V_S \cdot \frac{6}{10}$$

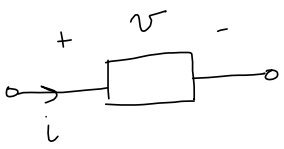
$V_S = 20V \Rightarrow V_x = 12V$

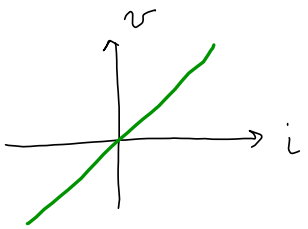
$V_{S1} = 12V \Rightarrow V_{x1} = 7.2V$

$V_{S2} = 8V \Rightarrow V_{x2} = 4.8V$

$V_S = 20V$ $V_x = 12V$

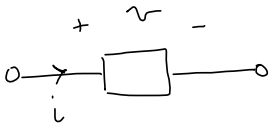
Homogeniety

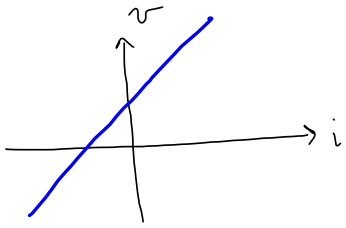




$v = ki$

$i = 2i \quad v = 2v$





$v = mi + b$

$i = 2i \quad v \neq 2v$

Superposition Steps

① Identify all independent sources in ckt => n

② Turn n-1 sources off

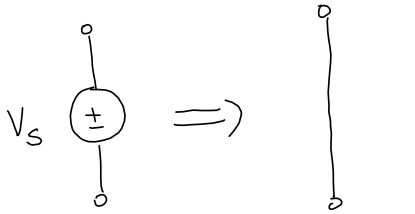
③ Solve circuit using any method you like.

I_{x1} V_{g1}

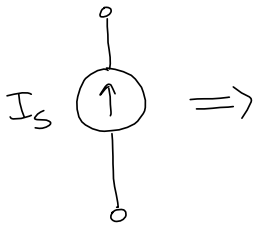
iterate until each source has been on one time

④ Sum parts together

Turning sources off

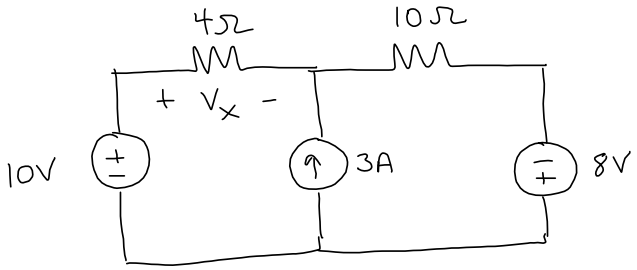


replace w/ short ckt

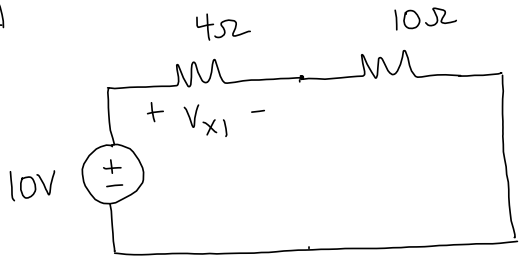


replace w/ open ckt

Find V_x using superposition



10V ON



$$V_{x1} = 10\left(\frac{4}{14}\right)$$

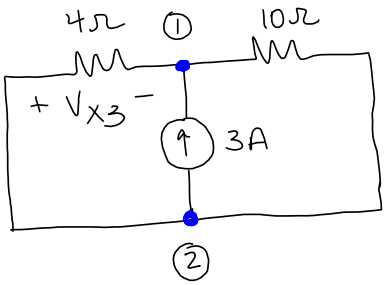
$$\boxed{V_{x1} = 2.86\ V}$$

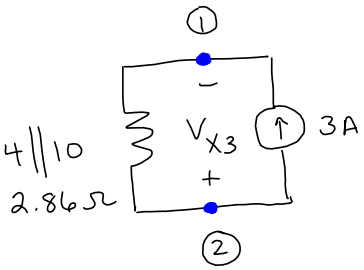
8V ON:

$$V_{x2} = 8\left(\frac{4}{14}\right)$$

$$\boxed{V_{x2} = 2.29\ V}$$

3A ON:





$$V_{x3} = -3(2.86)$$

$$\boxed{V_{x3} = -8.57\ V}$$

$$V_x = V_{x1} + V_{x2} + V_{x3}$$

$$= 2.86 + 2.29 + (-8.57)$$

$$\boxed{V_x = -3.42}$$