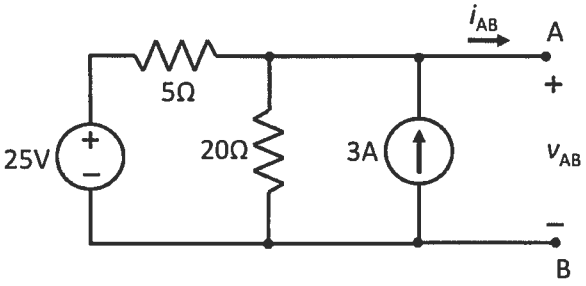
ECSE-200 Quiz # 7 ($1A_{16}$ Oct 2018)

NAME_____ McGill ID#_____

READ each question carefully. Do your work independently. SHOW ALL YOUR WORK. Give units on your answers (where appropriate).

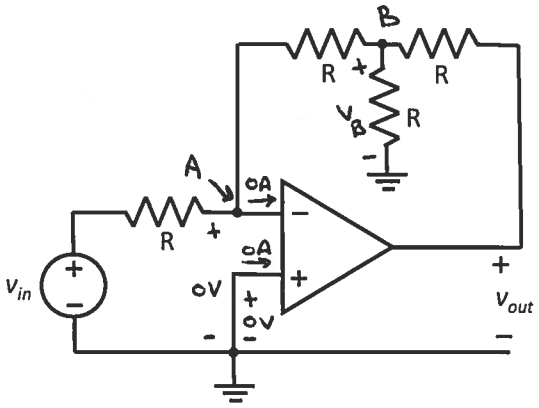
Consider the circuit diagram to the right.



1) What is the Thévenin equivalent circuit with respect to the terminals A and B? [2pts]

2) What is the maximum power that the circuit can deliver to an optimally chosen load resistor at the terminals A and B? [2pts]

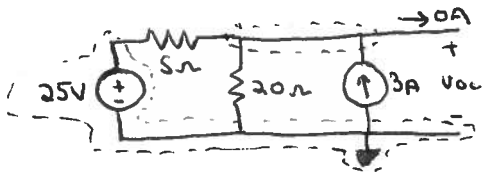
Consider the op-amp circuit diagram to the right. Assume ideal op-amp behaviour.



3) What are the equations describing the virtual short approximation and open input approximation of an ideal op-amp? [2pts]

4) What is v_{out}/v_{in} for the op-amp circuit shown? [2pts]

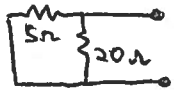
1) open circuit conditions



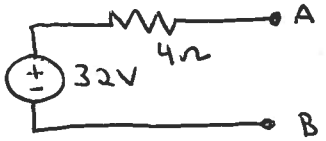
$0 = -3A + \frac{V_{oc}}{20\Omega} + \frac{V_{oc}-25V}{5\Omega}$

$V_{oc} = 32V$

turn off sources



$R_T = 5\Omega \| 20\Omega$
$= 4\Omega$



[+1 for V_{oc}]
[+1 for R_T]

2) $P_{max} = \frac{V_{oc}}{2} \cdot \frac{i_{sc}}{2}$ [+1]

$= \frac{V_{oc}^2}{4R_T} = 64W$ [+1]

3) $i_1 = i_2 = 0A$ [+1] $\quad v_1 = v_2$ [+1]

4) KCL at A: $0 = \frac{0-v_{in}}{R} + \frac{0-v_B}{R}$

$\therefore v_B = -v_{in}$

KCL at B: $0 = \frac{v_B - 0}{R} + \frac{v_B}{R} + \frac{v_B - v_{out}}{R}$

$\therefore v_{out} = 3v_B$

$\frac{v_{out}}{v_{in}} = -3$ [+2]