PENNSTATE

Office of Continuing and Distance Education
College of Engineering

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College of Engineering
The Pennsylvania State University
301-A Engineering Unit C
University Park, PA 16802
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You are receiving this exam for a student enrolled in EE 211/212 at Penn State University.

PLEASE NOTE:
The student has a maximum of **1 1/2 Hours (90 Minutes)** to complete the exam. The examination is **closed book/notes. Calculators are permitted.**

The use of any Cell Phone or electronic device during this exam is prohibited.

Proctor: Please complete the information below and return this form with the Exam.

_____ _____
Student Name (Please Print) Proctor Name (Please Print)

_____ _____
Student Signature Proctor Signature

Date: _____

Start Time: _____
End Time: _____

If you have an administration question, please contact Alex Zimmerman at the above number or by email at alz@engr.psu.edu

Thank you for agreeing to be a proctor.

Alex Zimmerman

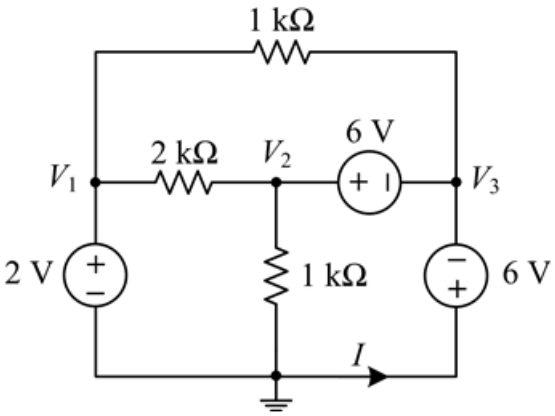
Alex Zimmerman
College of Engineering

Circle or check off the correct answers in this exam.

Name:_____

Problem 1

1.

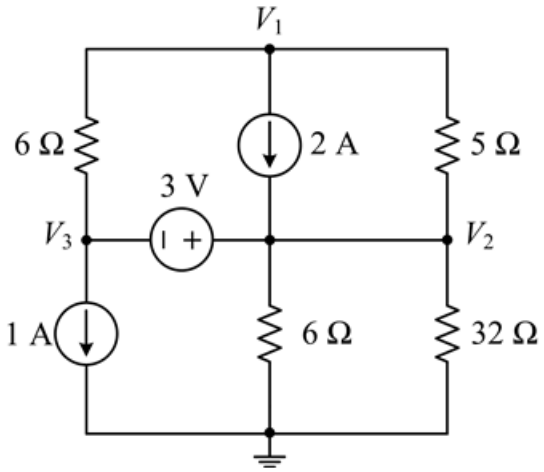


Using nodal analysis, solve for the current I.

- ○ A) −9 mA
- ○ B) 9 mA
- ○ C) −12 mA
- ○ D) 0 mA
- ○ E) 12 mA

Problem 2

2.

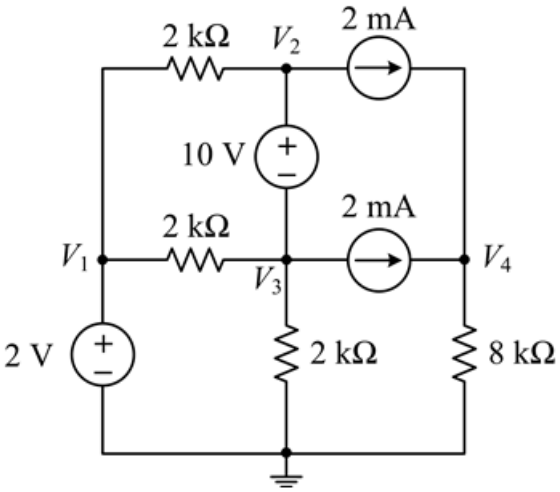


The supernode used to solve this circuit is located between which two nodes?

- A) V_3 and Ground
- B) V_1 and V_3
- C) V_2 and V_3
- D) V_1 and V_2
- E) V_2 and Ground

Problem 3

3.

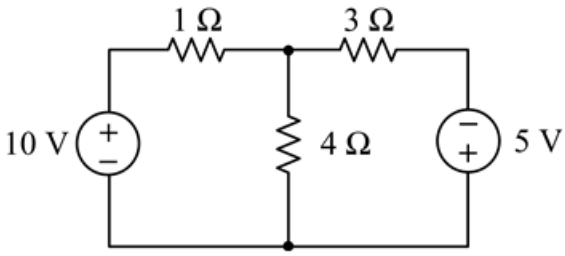


Solve for the voltages V_2 and V_3 in the above circuit.

A) $V_2 = 4.33$ V and $V_3 = -5.67$ V
B) $V_2 = 7.33$ V and $V_3 = -2.67$ V
C) $V_2 = 5.33$ V and $V_3 = -4.67$ V
D) $V_2 = 15.67$ V and $V_3 = 5.57$ V
E) $V_2 = 14.67$ V and $V_3 = 4.67$ V

Problem 4

4.

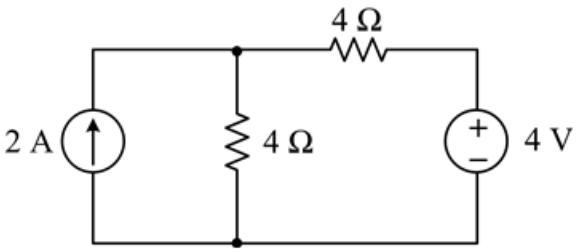


Solve for the voltage drop across the 4 ohm resistor.

- A) 3.75 V
- B) 7.5 V
- C) 5.94 V
- D) 5.26 V
- E) 0 V

Problem 5

5.

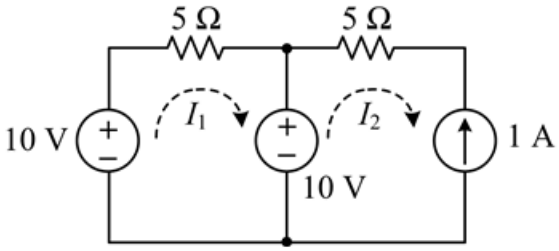


Find the power supplied by the 2A source.

- A) −12 W
- B) −2 W
- C) 18 W
- D) 12 W
- E) 2 W

Problem 6

6.

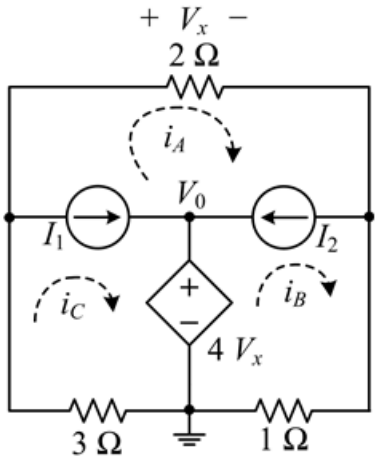


Solve for the currents I_1 and I_2 in the above circuit.

A) $I_1 = -2$ A and $I_2 = 1$ A
B) $I_1 = 0.5$ A and $I_2 = -1$ A
C) $I_1 = -2$ A and $I_2 = -1$ A
D) $I_1 = 0$ A and $I_2 = 1$ A
E) $I_1 = 0$ A and $I_2 = -1$ A

Problem 7

7.

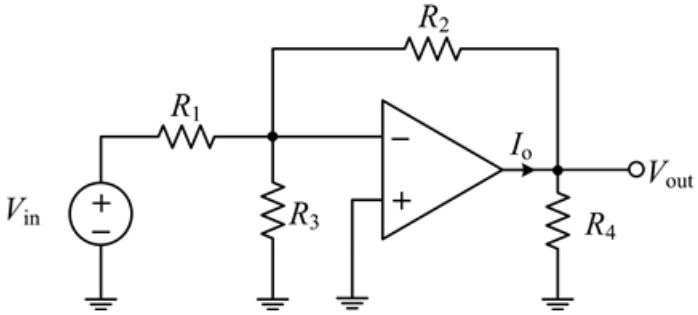


Which of the following answers describes the supermesh equation for the circuit shown above?

- A) $2i_A - i_B - 3i_C = 0$
- B) $2i_A + i_B + i_C = 0$
- C) $-2i_A + i_B - 3i_C = 0$
- D) $i_A + i_B + 3i_C = 0$
- E) $2i_A + i_B + 3i_C = 0$

Problem 8

8.

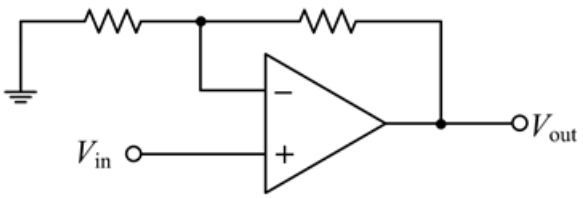


Which resistor(s) affect(s) the gain V_{out}/V_{in}?

- A) R_4
- B) R_3
- C) R_1 and R_2
- D) R_1, R_2, and R_3
- E) R_1

Problem 9

9.

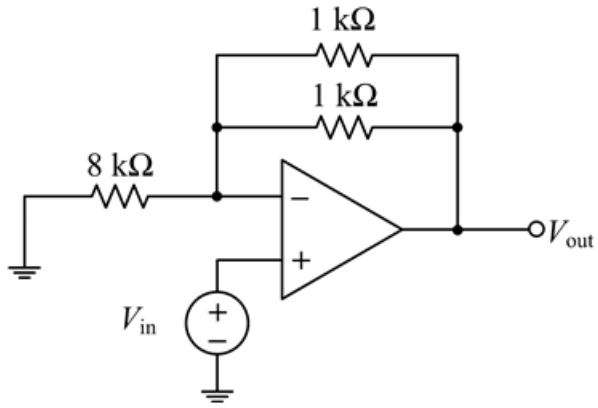


Which answer best describes the function of the above circuit?

- ○ A) Inverting amplifier
- ○ B) Unity-gain buffer
- ○ C) Difference amplifier
- ○ D) Inverting summer
- ○ E) Noninverting amplifier

Problem 10

10.

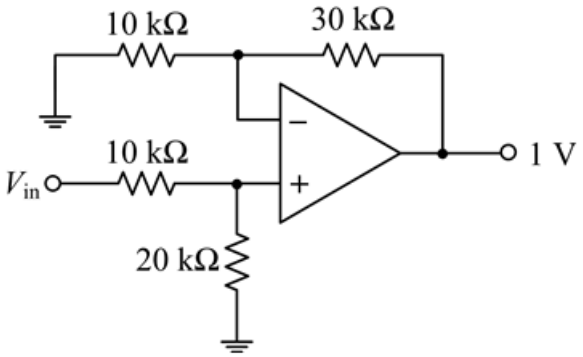


Solve for the gain, V_{out}/V_{in} , of the circuit above.
Assume that the op amp is ideal and is operating in its linear region.

- ○ A) 0.125 V/V
- ○ B) 1.0625 V/V
- ○ C) 1.125 V/V
- ○ D) 1 V/V
- ○ E) 0.0625 V/V

Problem 11

11.

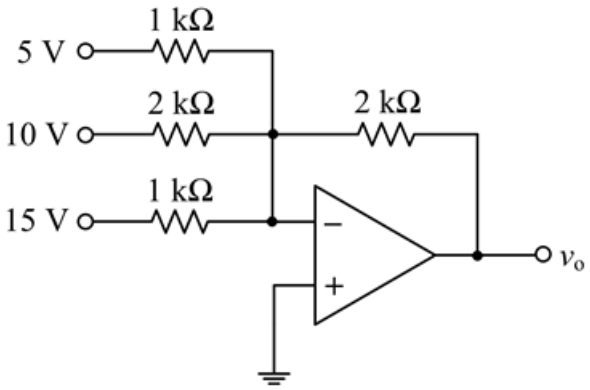


Which of the following input voltage values produce 1V at the op-amp output? Assume that the op-amp is ideal and is operating in its linear region.

- A) 0.75 V
- B) 0.6 V
- C) 1 V
- D) 0 V
- E) 0.375 V

Problem 12

12.

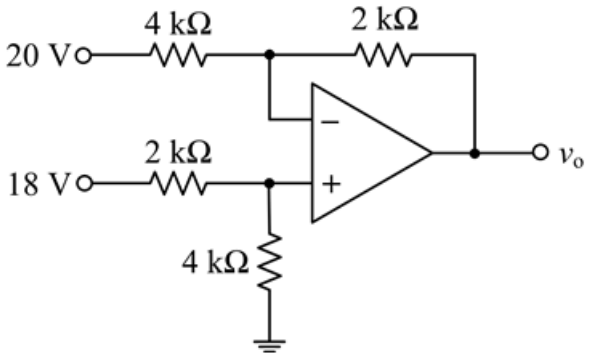


Solve for the value of v_o in the circuit above.
Assume that the op-amp is ideal and is operating in its linear region.

- A) −25 V
- B) 25 V
- C) −50 V
- D) 75 V
- E) 50 V

Problem 13

13.

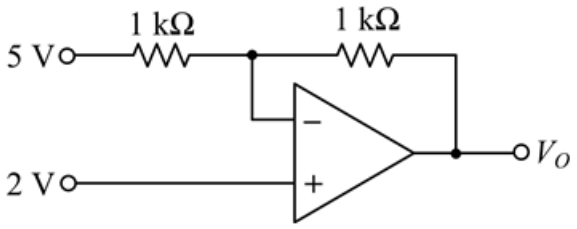


Solve for the value of v_o in the circuit above.
Assume that the op-amp is ideal and is operating in its linear region.

- A) 4 V
- B) 2 V
- C) 1 V
- D) 8 V
- E) 6 V

Problem 14

14.

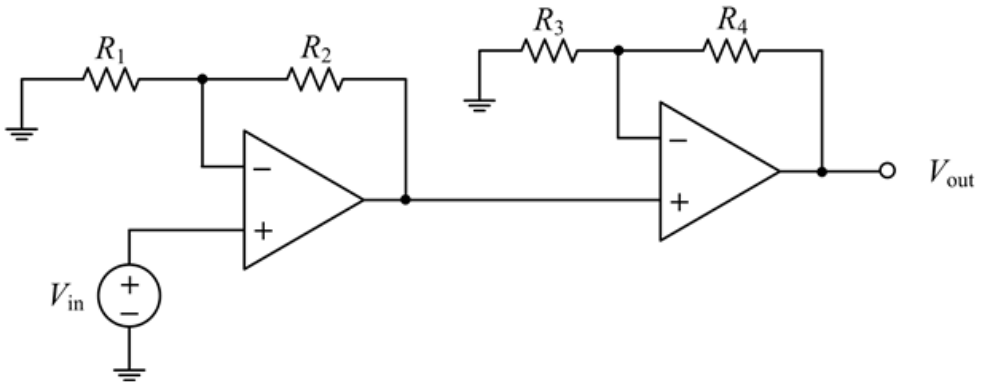


Determine the value of v_o, given the input voltages shown.
Assume that the op amp is ideal and is operating in the linear region.

- A) −1 V
- B) 10 V
- C) −2 V
- D) 0 V
- E) −5 V

Problem 15

15.

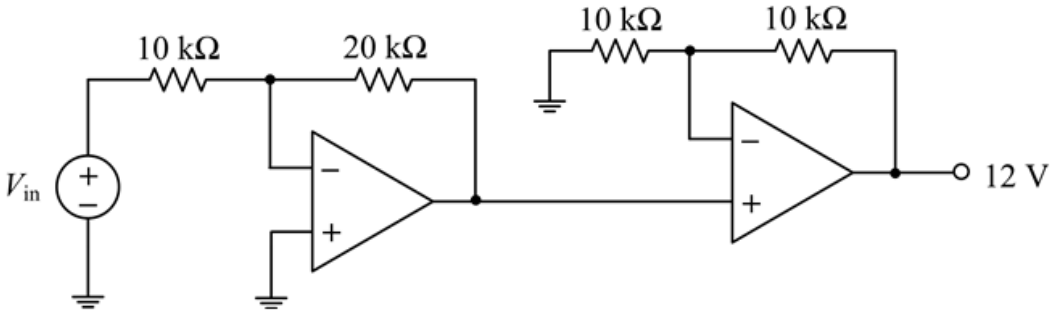


Which resistor values result in a circuit gain, V_{out}/V_{in}, of +5000 V/V?

- A) $R_1 = 500\ \text{k}\Omega$, $R_2 = 1\ \text{k}\Omega$, $R_3 = 10\ \text{k}\Omega$, $R_4 = 1\ \text{k}\Omega$
- B) $R_1 = 499\ \text{k}\Omega$, $R_2 = 1\ \text{k}\Omega$, $R_3 = 9\ \text{k}\Omega$, $R_4 = 1\ \text{k}\Omega$
- C) $R_1 = 1\ \text{k}\Omega$, $R_2 = 500\ \text{k}\Omega$, $R_3 = 1\ \text{k}\Omega$, $R_4 = 10\ \text{k}\Omega$
- D) None of the following are correct
- E) $R_1 = 1\ \text{k}\Omega$, $R_2 = 499\ \text{k}\Omega$, $R_3 = 1\ \text{k}\Omega$, $R_4 = 9\ \text{k}\Omega$

Problem 16

16.

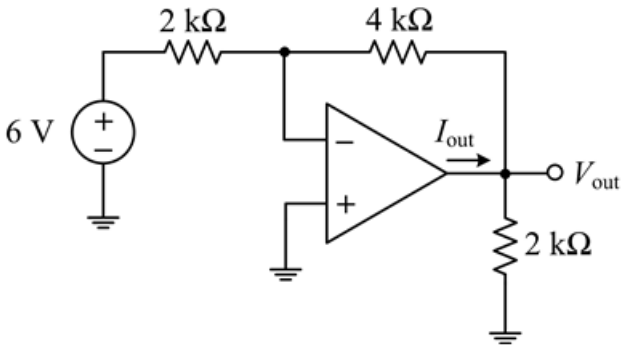


Solve for the value of V_{in} needed to produce 12 V at the output.
Assume that the op-amps are ideal and are operating in their linear regions.

- A) 6 V
- B) −6 V
- C) 0 V
- D) 3 V
- E) −3 V

Problem 17

17.

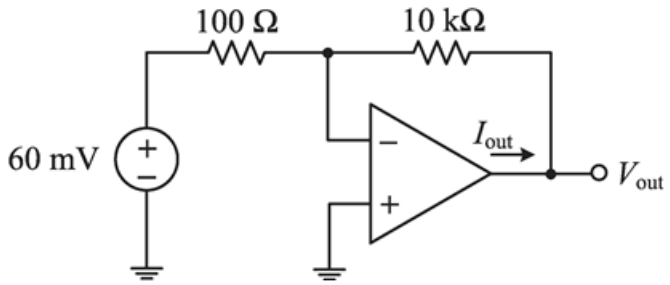


Determine the power supplied by the op-amp in the circuit above.
Assume that the op-amp is ideal and is operating in its linear region.

- ○ A) −120 mW
- ○ B) 108 mW
- ○ C) 0 W
- ○ D) 120 mW
- ○ E) −108 mW

Problem 18

18.

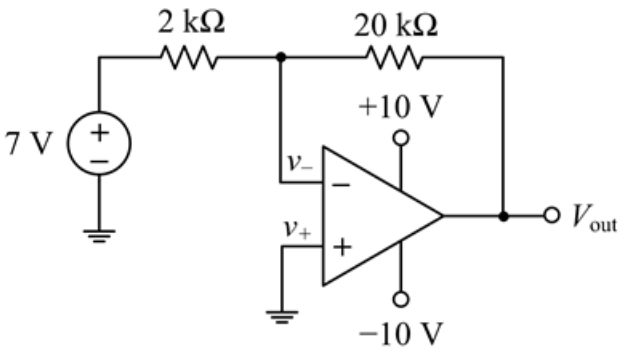


Determine the power supplied by the op-amp in the circuit above.
Assume that the op-amp is ideal and is operating in its linear region.

- A) 6.4 mW
- B) 1.6 mW
- C) 0 W
- D) 3.6 mW
- E) 8 mW

Problem 19

19.

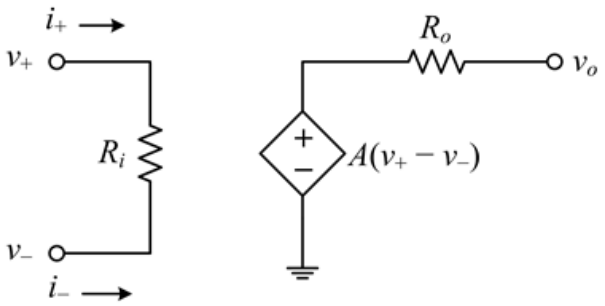


The op amp in the above circuit is ideal and has a saturation voltage of ±10 V. Solve for the voltage, v_-, at the inverting input terminal.

- A) −5.45 V
- B) −10 V
- C) 5.45 V
- D) 10 V
- E) 0 V

Problem 20-24

This last question consists of five true/false sub-parts, 1 point each.
All questions refer to the op amp model shown in the figure below:



20. In an ideal op amp the input currents i_+ and i_- are zero amperes.

- A) True
- B) False

21. In an ideal op amp the gain, A, is infinite.

- A) True
- B) False

22. In an ideal op amp the output resistance, R_o, is infinite.

- A) True
- B) False

23. In an ideal op amp when negative feedback is applied and when the op amp is not in saturation, the input voltages v_+ and v_- are equal.

- A) True
- B) False

24. In an ideal op amp the input resistance, R_i, is zero ohms.

- A) True
- B) False