(30) 3. Write out the node equations for each circuit. Simplify but do NOT solve (wheel!).
For (a): 2 equations in 2 unknowns v1, v2. For (b) & (c): 1 equation in 1 unknown v.

(a)  
(b)  
(c)  

**EECS 210**  
**SOLUTIONS TO EXAM #1 (Fri. 3/0)**  
Winter 2001

**Exams**

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**Hints**

1a. (i) \( \frac{100}{\sqrt{2}} \) (ii) 200 (iii) \( \frac{1}{2} \) (iv) 7 (v) 14π.  
1b. (i) 1 (ii) 1 (iii) 3 and 5.

**Gift**

1c. \( \cos(2\pi t) + 20 \cos(6\pi t) \) since the last term at 5 Hz is filtered out.

1d. \( \cos(2\pi t - 10^5) + 2 \cos(6\pi t - 30^5) + 4 \cos(10\pi t - 50^5) \) since 20dB=0.1.

**Gift**

2a. Voltage divider \( \frac{100}{10+100} = 5V \).

2b. (i) Current source: \( I_A + I_B \) (ii) Voltage source: 10V (lii) \( \frac{R_A R_B}{R_C + R_B + R_D} \)

2c. Node equation: \( \frac{V_{16}}{3} + \frac{V_{12}}{12} = 3 \rightarrow 5V = 48 + 72 \rightarrow V = 24V \). 

**8Ω:** \( (1A)^2(8Ω) = 8W \).  
**12Ω:** \( (1A)^2(12Ω) = 14W \).  
**24Ω:** \( (2A)^2(12Ω) = 48W \). **My Favorite Energy:** \( P = 15W \).  
**16V:** \( (16V)(1A) = 16W \).  
**3A:** \( (24V)(-3A) = -72W \).  

3a. \( \frac{V_1}{4} + \frac{V_2-V_3}{8} = 4 - 7 \); \( \frac{V_2-V_3}{8} + \frac{V_3}{12} = 7 \) **Problems with Tone of Correct Sources!** (ii) or (iii) depending.

\( \rightarrow 3V_1 - V_2 = -24; -3V_1 + 5V_2 = +168 \rightarrow V_1 = 4V, V_2 = 36V \). **This is almost correct!**

3b. \( \frac{V_1}{4} + \frac{V_3+V_2-20}{6} = 11V - 16 = 72 \rightarrow V = 8V \). **Solving by 4θ**

3c. \( \frac{V_{-12}}{1} + \frac{V_{-22}}{3} = 6 \); \( V_{12} = -\frac{V_{-12}}{1} - V_{-12} + V_{-22} - 8 = 6 \rightarrow V = 13V \). **And all else works.** **Congrats!**

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- Winter 2001

**Scores**

- **EECS 210**
- **SOLUTIONS TO EXAM #1 (Fri. 3/0)**
- Winter 2001

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**Median:** 21

**Final:** 59

**Pending:**