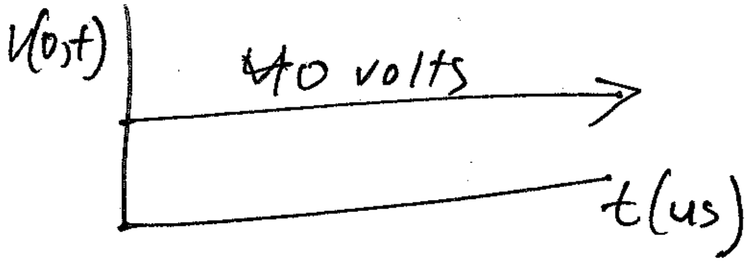
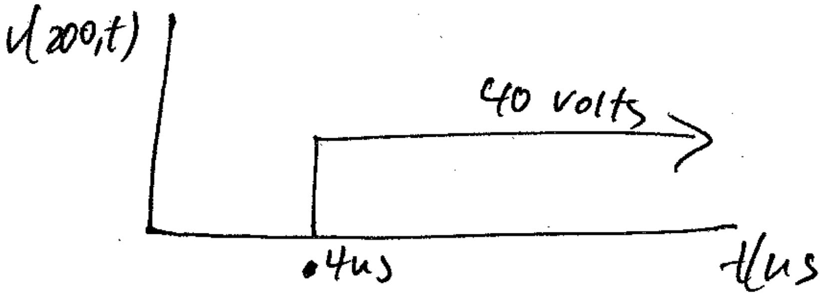
Mohammed Islam Homework Chapter 2

1a. For the circuit of Fig P 2-1, plot the voltages at both ends of the line.

$$\left(\frac{R_0}{R_0 + R_1}\right) * E = \left(\frac{50}{50 + 100}\right) * 80 = 40\ Volts$$

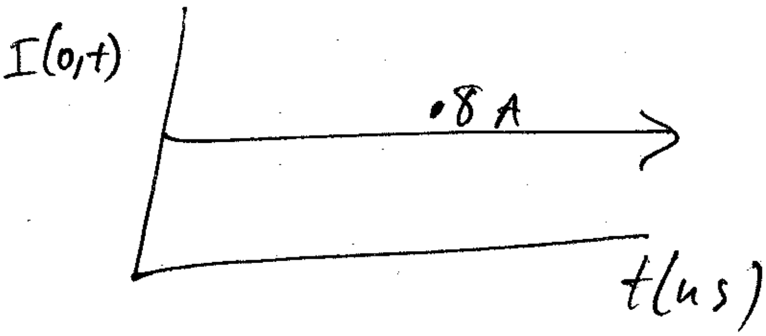
$$t = \frac{d}{v} = \frac{80}{200\ m/\mu s} = .4\ \mu s$$

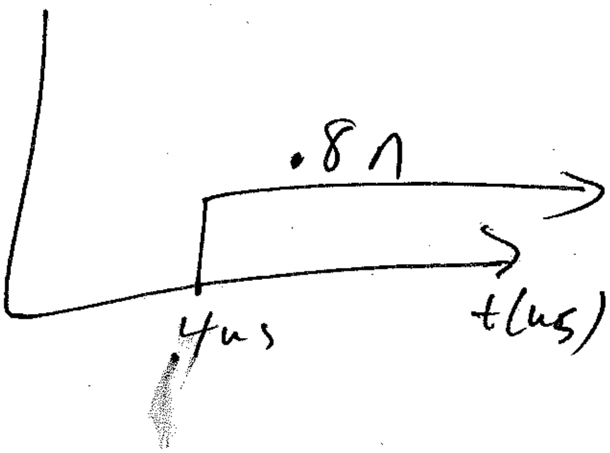




1b. Repeat (a) for the currents at both ends of the line.

$$I = \frac{40\ Volts}{50 - \Omega} = .8\ \text{Amps}$$



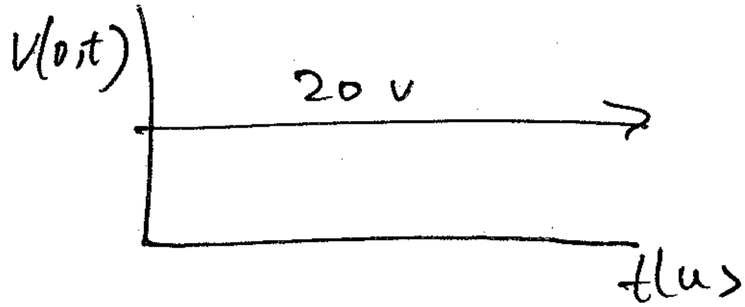


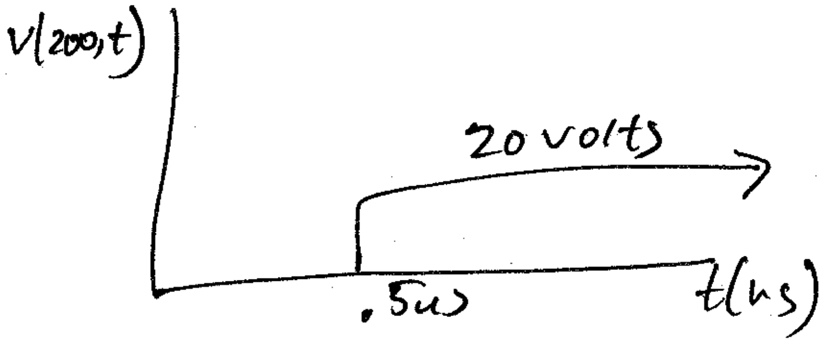
2a. For the circuit of Fig. P2-2, plot the voltages at both ends of the line.

$\Gamma_{1=}\dfrac{R_1-R_0}{R_0+R_0}=\dfrac{300-300}{300+300}=0$

$\Gamma_{2=}\dfrac{R_2-R_0}{R_2+R_0}=\dfrac{300-300}{300+300}=0$

$\left(\dfrac{R_0}{R_0+R_1}\right)*E=\left(\dfrac{300}{300+300}\right)*40=20\,Volts$

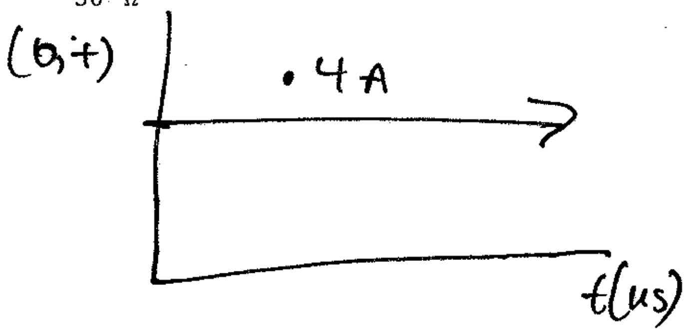


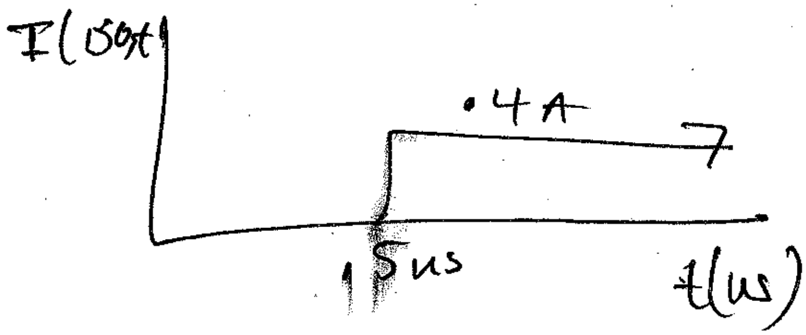


2b) Repeat (a) for the currents at both ends of the line.

$t=\dfrac{d}{v}=\dfrac{150}{300\ m/\mu s}=.5\ \mu s$

$I=\dfrac{20\ Volts}{50-\Omega}=.4\ \text{Amps}$





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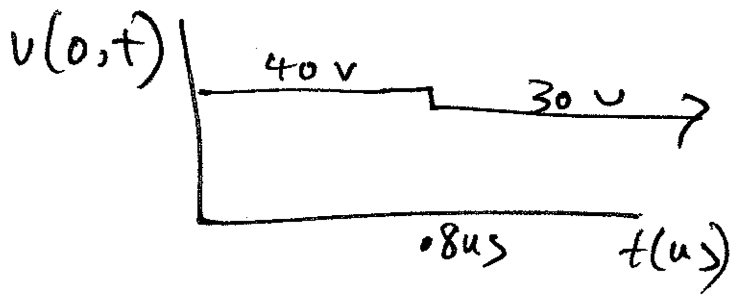
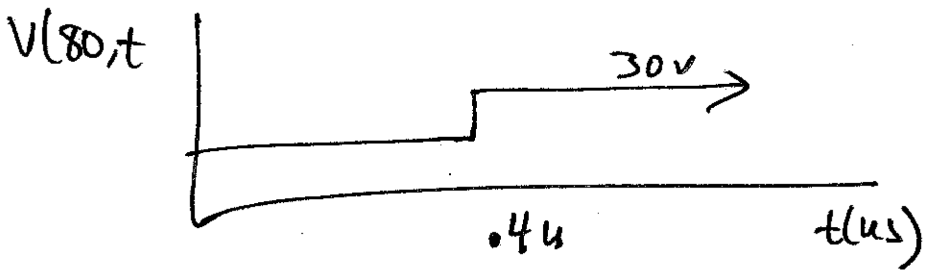
3a) For the circuit of Fig. P2-3, plot the voltages at both ends of the line.

$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{50-50}{50+50} = \frac{0}{100} = 0$

$\Gamma_2 = \frac{R_2 - R_0}{R_2 + R_0} = \frac{30-50}{30+50} = \frac{-20}{80} = \frac{-1}{4}$

$\left(\frac{R_0}{R_0 + R_1}\right) * E = \left(\frac{50}{50+50}\right) * 80 = 40\ Volts$





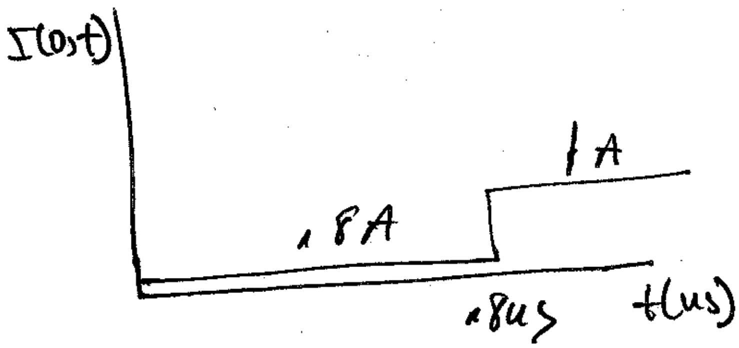
3b) Repeat (a) for the currents at both ends of the line.

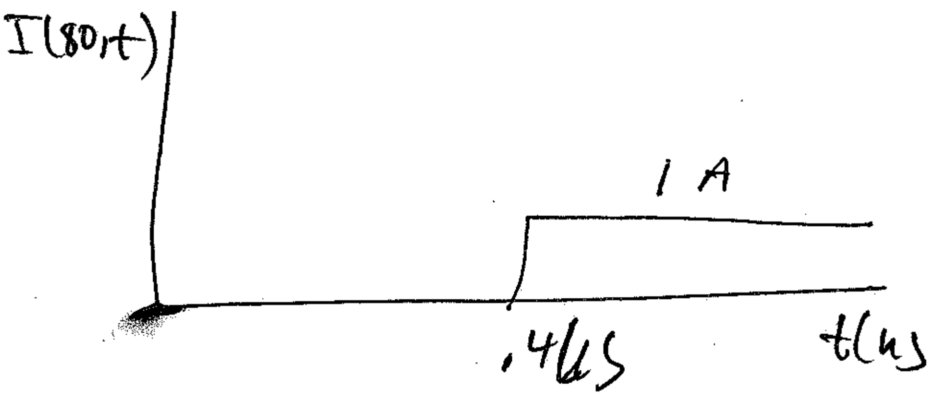
$t = \frac{d}{v} = \frac{80}{200\ m/\mu s} = .4\ \mu s$

$I = \frac{40 Volts}{50\text{-}\Omega} = .8\ \text{Amps}$

$I\Gamma_1 = 0$

$I\Gamma_2 = \frac{1}{4}$



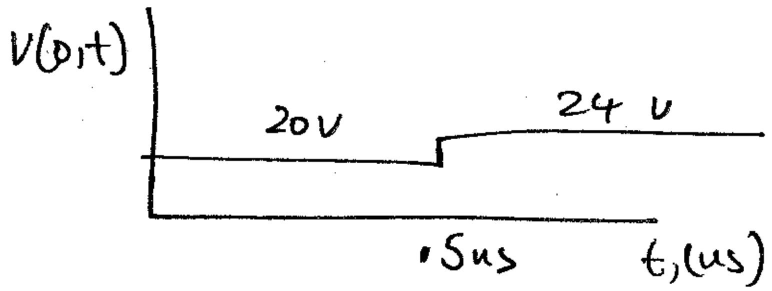


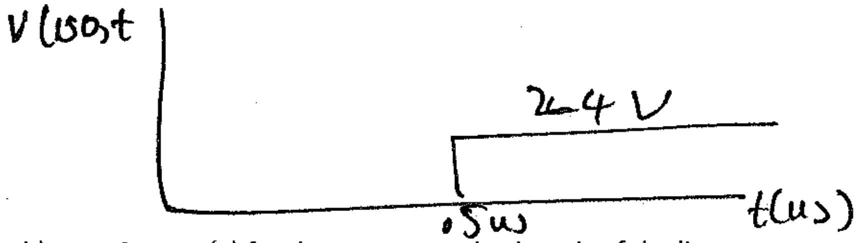
4a) For the circuit of Fig P2-4, plot the voltages at both ends of the line.

$$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{300-300}{300+300} = \frac{0}{600} = 0$$

$$\Gamma_2 = \frac{R_2 - R_0}{R_2 + R_0} = \frac{450-300}{450+300} = \frac{150}{750} = .2$$

$$\left(\frac{R_0}{R_0 + R_1}\right) * E = \left(\frac{300}{300+300}\right) * 80 = 40\ Volts$$





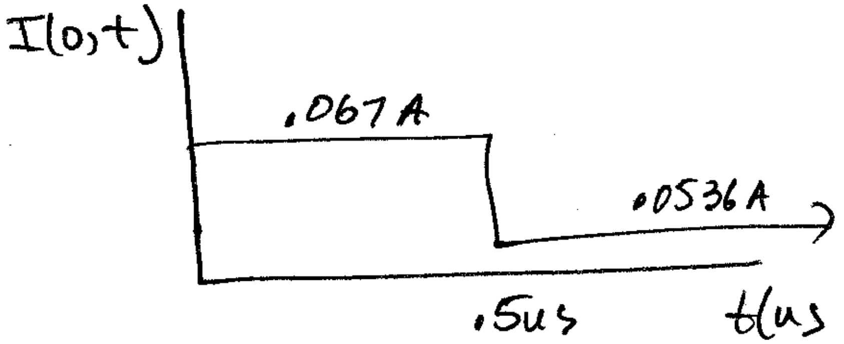
b) Repeat (a) for the currents at both ends of the line.

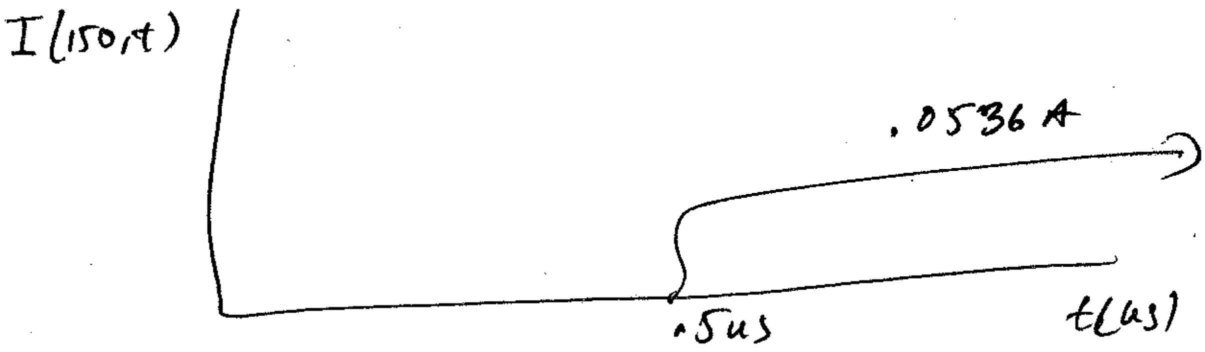
$$t = \frac{d}{v} = \frac{150}{300m/\mu s} = .5\ \mu s$$

$$I = \frac{20\ Volts}{300\text{-}\Omega} = .067\ \text{Amps}$$

$I\ \Gamma_1 = 0$

$I\ \Gamma_{2=}$ -.2



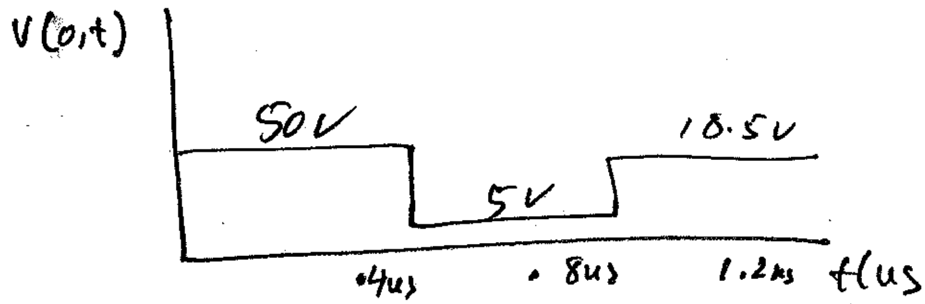


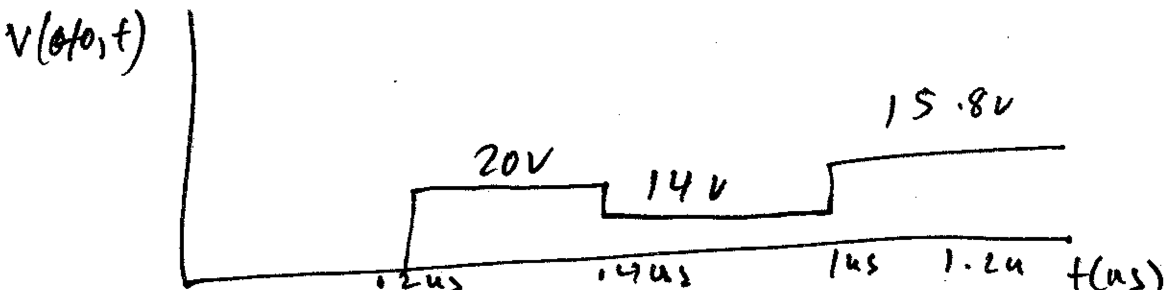
5a) For the circuit of Fig. P2-5, plot the voltages at both ends of the line.

$$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{150-50}{150+50} = \frac{100}{200} = .5$$

$$\Gamma_2 = \frac{R_2 - R_0}{R_2 + R_0} = \frac{12.5-50}{12.5+50} = \frac{-37.5}{62.5} = -.6$$

$$\left(\frac{R_0}{R_0 + R_1}\right) * E = \left(\frac{50}{50+150}\right) * 200 = 50\,Volts$$





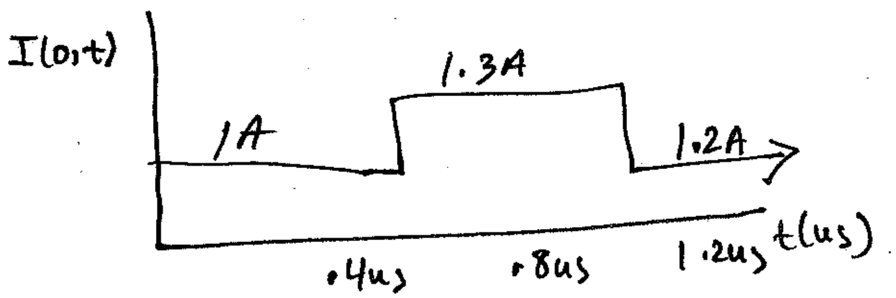
5b) Repeat (a) for the currents at both ends of the line.

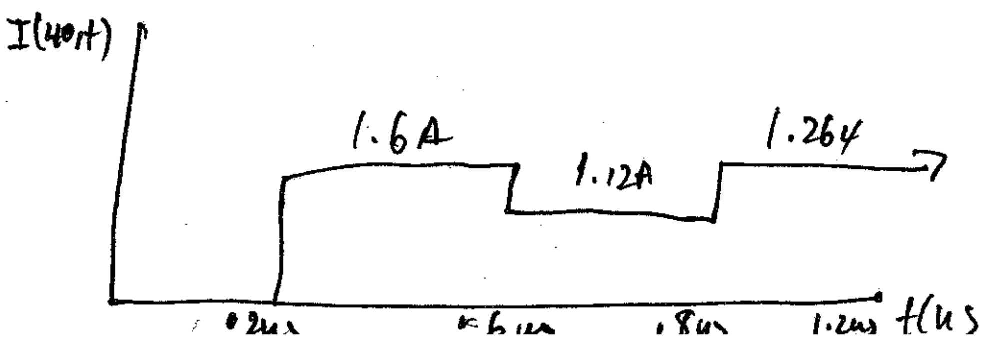
$$t = \frac{d}{v} = \frac{40}{200\ m/\mu s} = .2\ \mu s$$

$$I = \frac{20\ Volts}{300-\Omega} = .067\ \text{Amps}$$

I $\Gamma_1 = -.5$

I $\Gamma_2 = +.6$



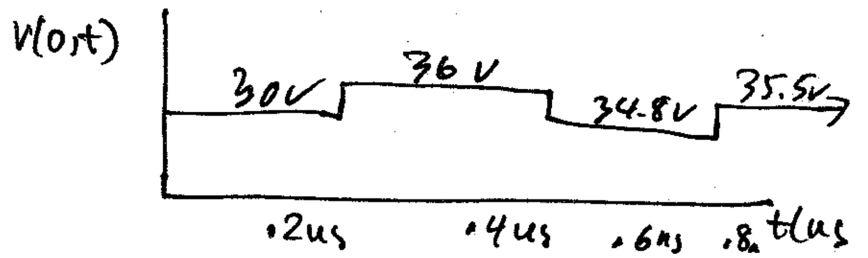


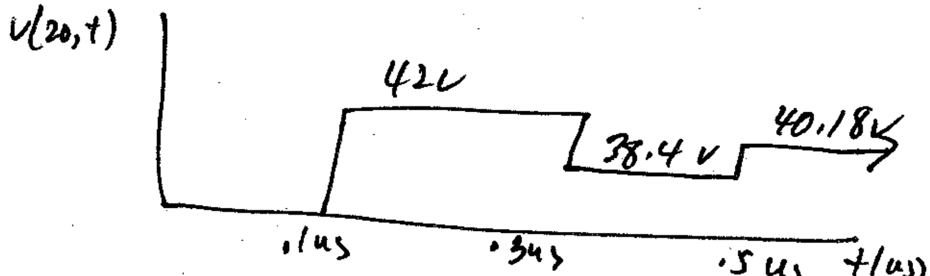
6a) For the circuit of Fig. P2-6, plot the voltages at both ends of the line.

$$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{25-75}{25+75} = \frac{-50}{100} = -.5$$

$$\Gamma_2 = \frac{R_2 - R_0}{R_2 + R_0} = \frac{175-75}{175+75} = \frac{100}{250} = .4$$

$$\left(\frac{R_0}{R_0 + R_1}\right) * E = \left(\frac{75}{75+25}\right) * 40 = 30\,Volts$$





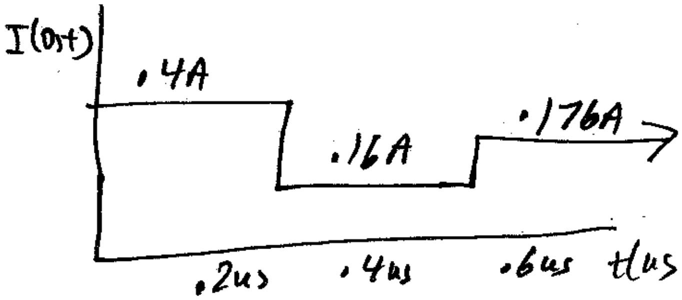
6b) Repeat (a) for the currents at both ends of the line.

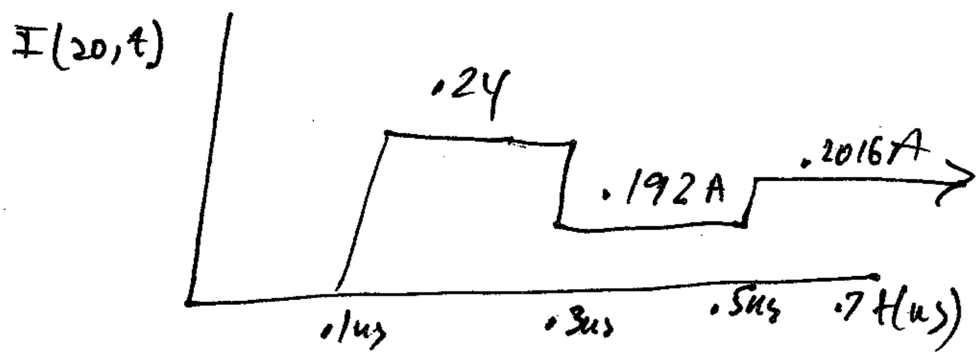
$$t = \frac{d}{v} = \frac{20}{200\,m/\mu s} = .1\ \mu s$$

$$I = \frac{30\,Volts}{75\text{-}\Omega} = .4\ \text{Amps}$$

$I\,\Gamma_1 = .5$

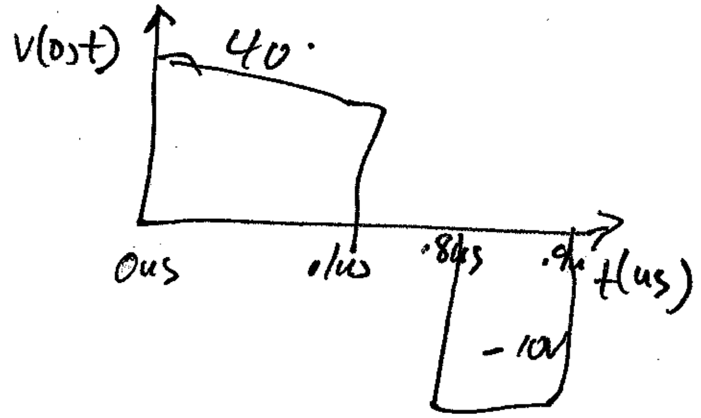
$I\,\Gamma_2 = -.4$

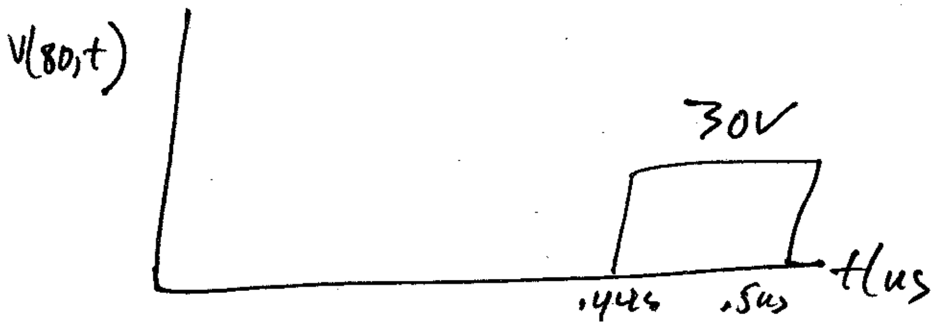




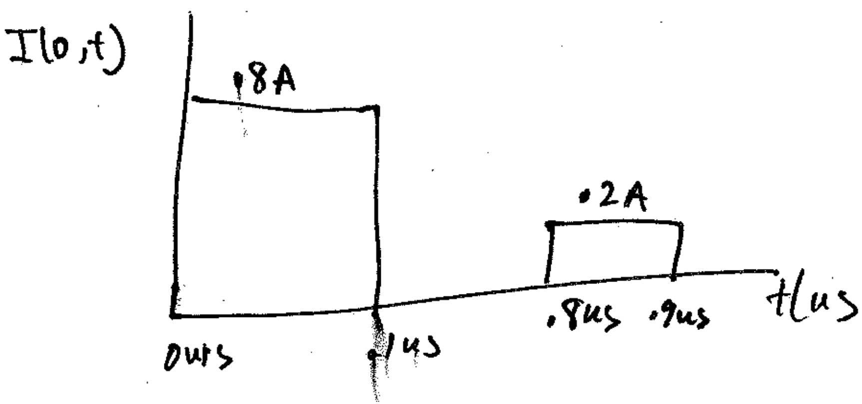
7) Assume in the circuit of Problem 2-3 (Fig. P2-3) that the 80-V dc source is replaced by an 80-V pulse of width 0.1 μs starting at t=0.

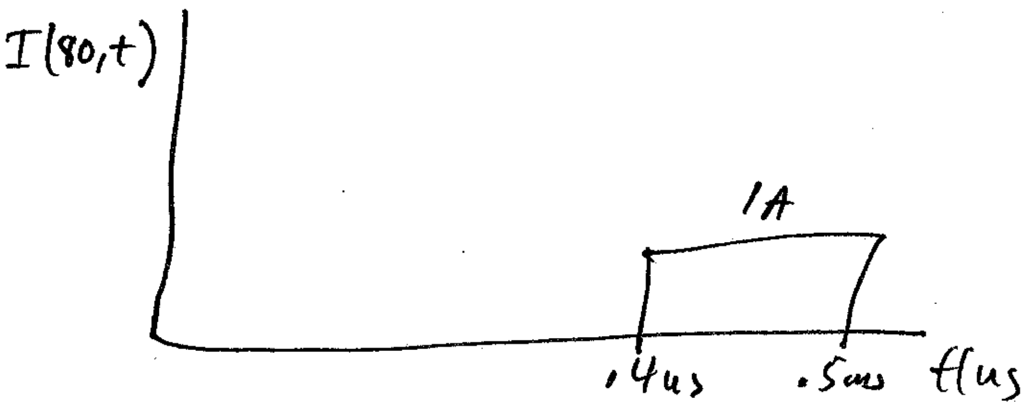
a) Plot the voltages at the two ends of the line.





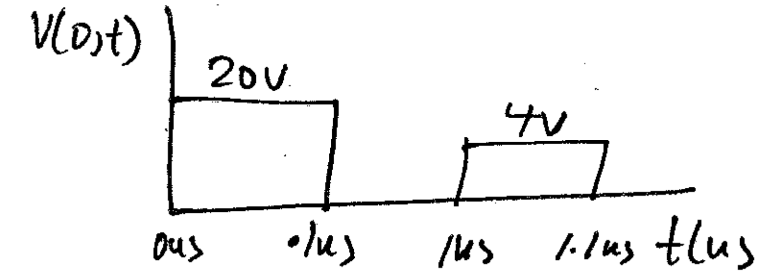
b) Plot the currents at the two ends of the line.

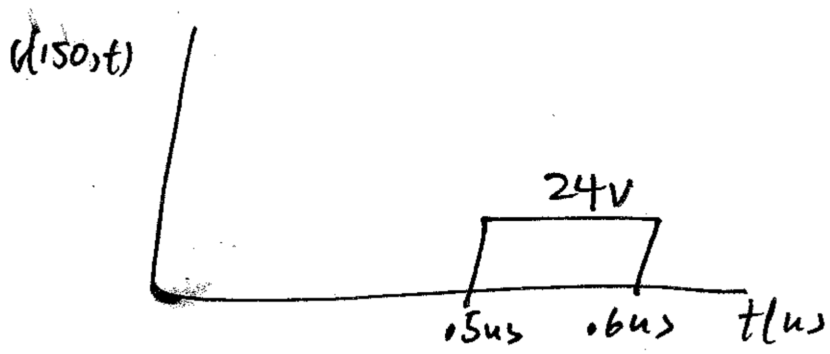




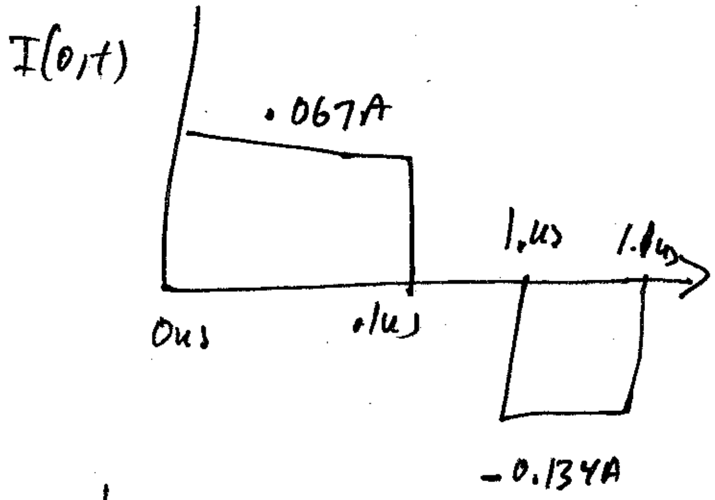
8) Assume in the circuit of Problem 2-4 (Fig. P2-4) that the 40-V dc source is replaced by an 40-V pulse of width 0.1 μs starting at t=0.

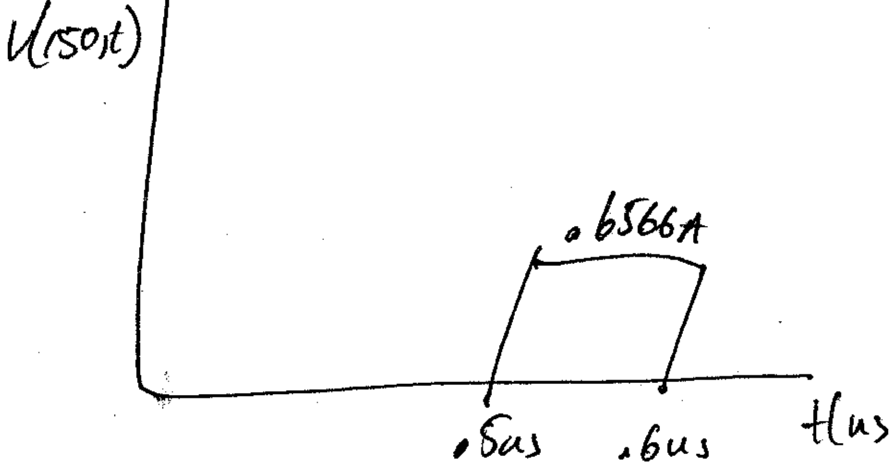
a) Plot the voltages at the two ends of the line.





b) Plot the currents at the two ends of the line.





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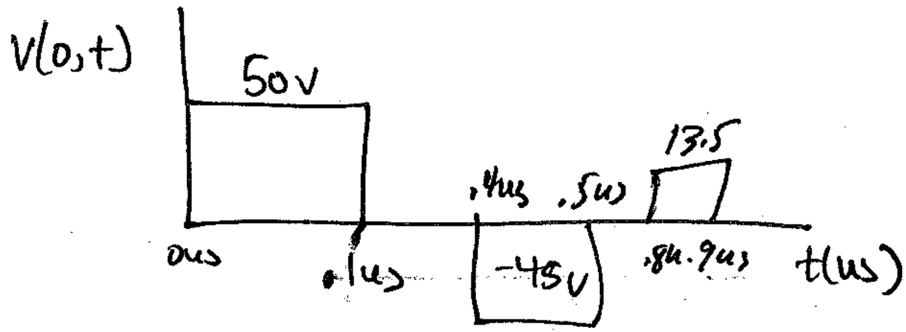
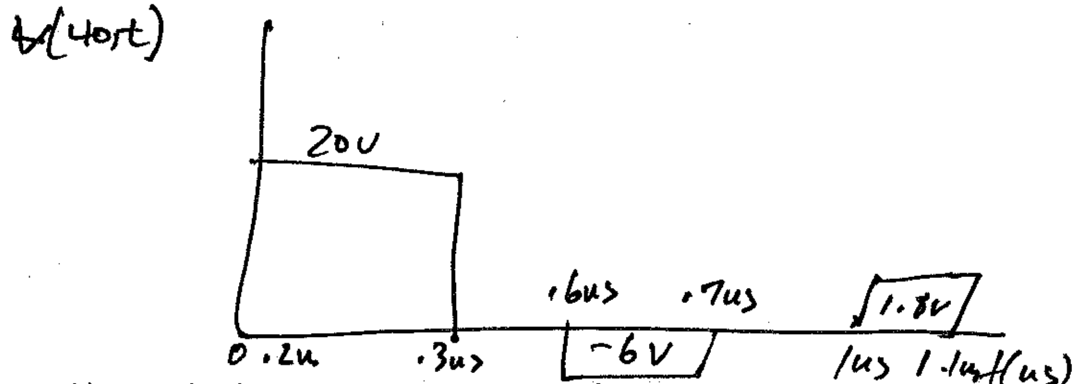
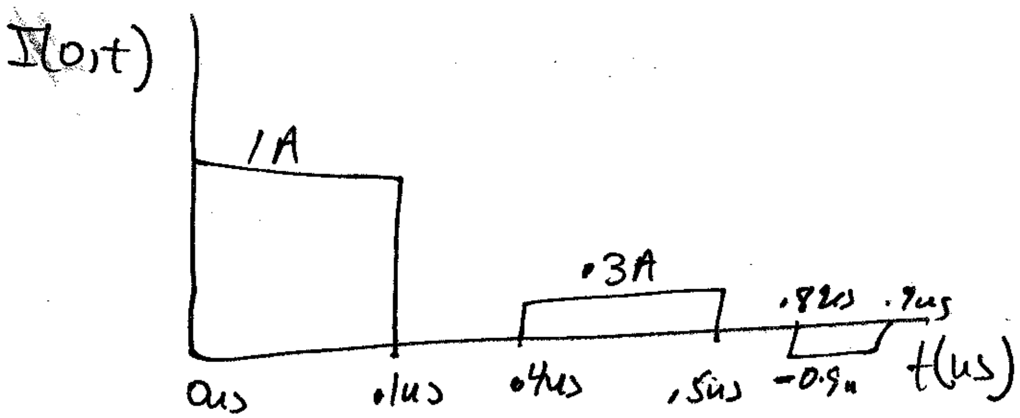
9) Assume in the circuit of Problem 2-5 (Fig. P2-5) that the 200-V dc source is replaced by an 200-V pulse of width 0.1 µs starting at t=0.

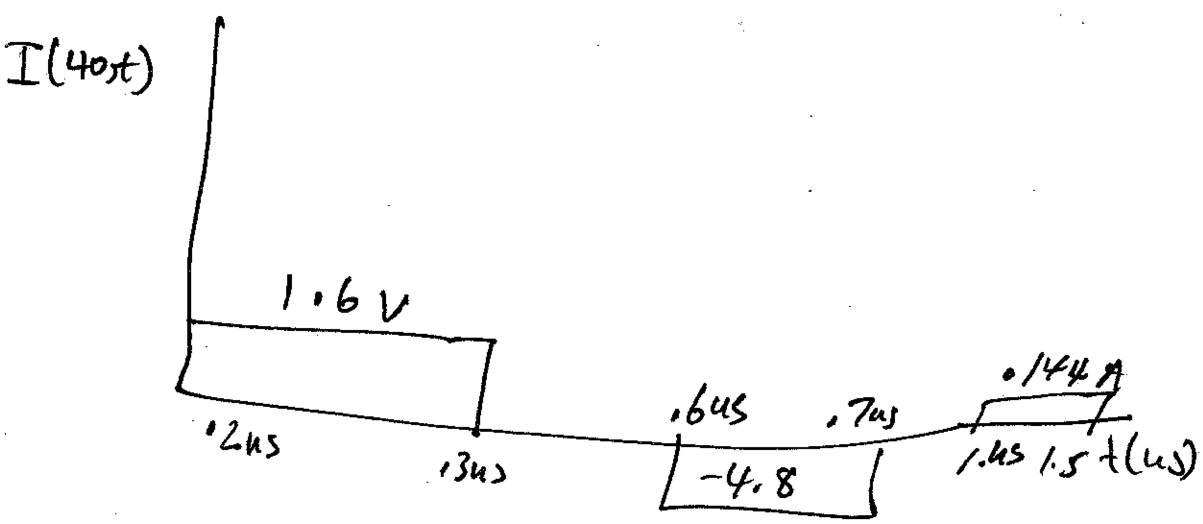
a) Plot the voltages at the two ends of the line.





b) Plot the currents at the two ends of the line.





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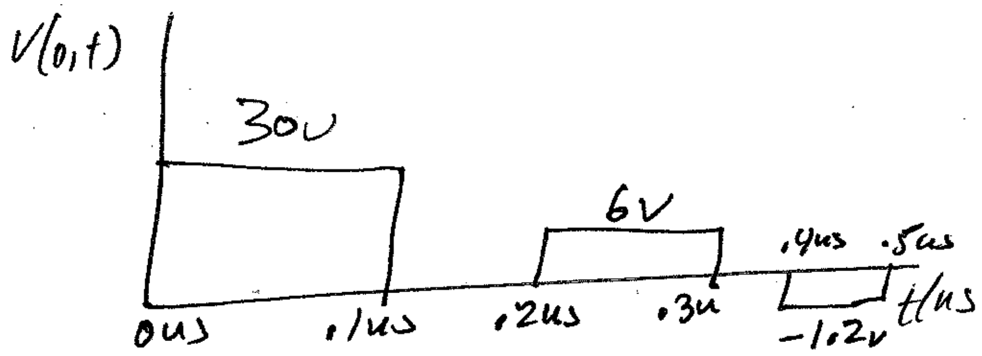
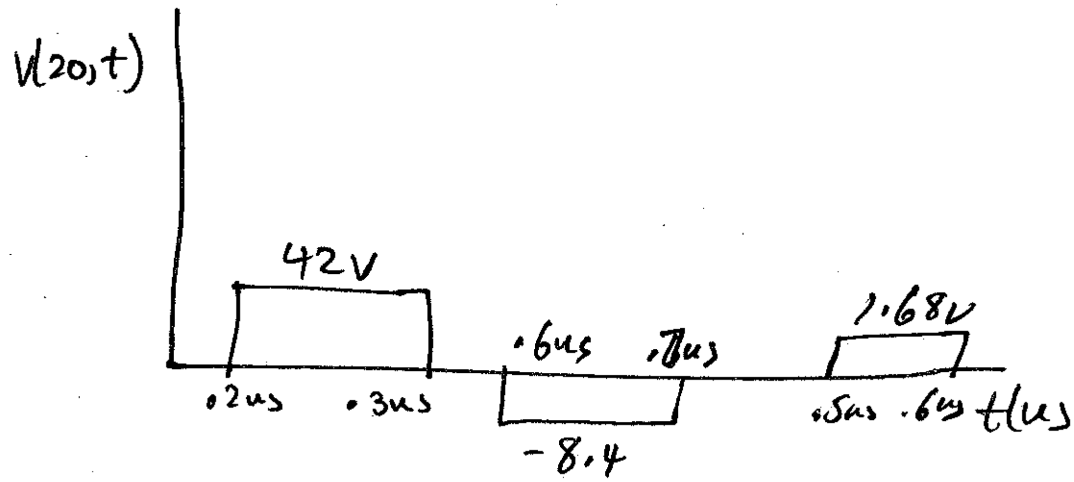
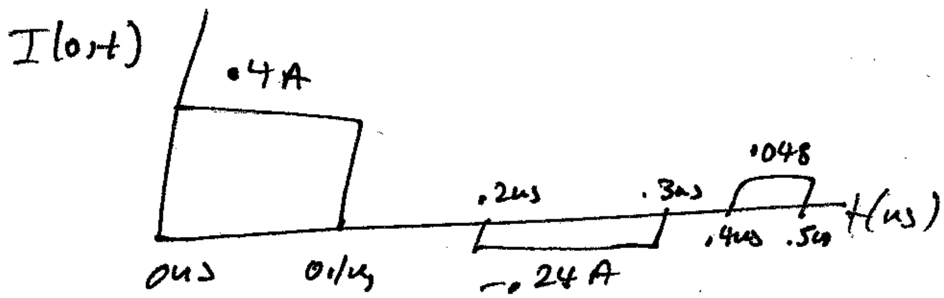
10) Assume in the circuit of Problem 2-6 (Fig. P2-6) that the 40-V dc source is replaced by an 40-V pulse of width 0.1 μs starting at t=0.

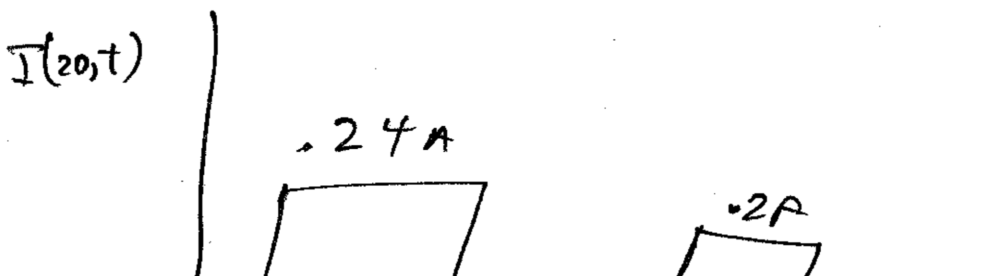
a) Plot the voltages at the two ends of the line.





b) Plot the currents at the two ends of the line.



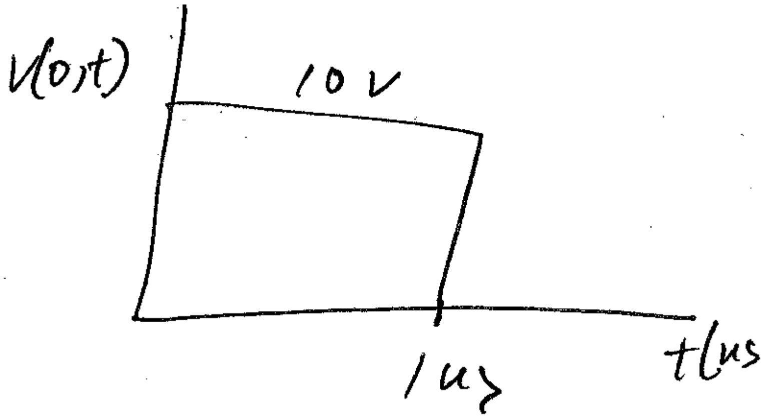


11) For the circuit of Fig. P 2-11, plot the voltage v(0,t).

$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{50-50}{50+50} = 0$

$\Gamma_2 = \frac{R_2 - R_0}{R_2 + R_0} = \frac{0-50}{0+50} = -1$

$t = \frac{d}{v} = \frac{100}{200\ m/\mu s} = .5\ \mu s$

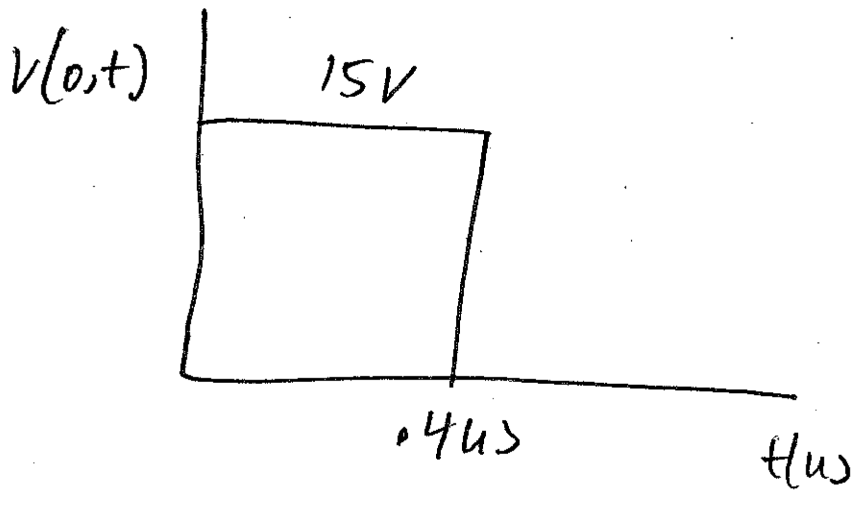


12) For the circuit of Fig. P2-12, plot the voltage v(0,t),

$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{75-75}{75+75} = 0$

$\Gamma_2 = \frac{R_2 - R_0}{R_2 + R_0} = \frac{0-75}{0+75} = -1$

$t = \frac{d}{v} = \frac{40}{200\ m/\mu s} = .20\ \mu s$



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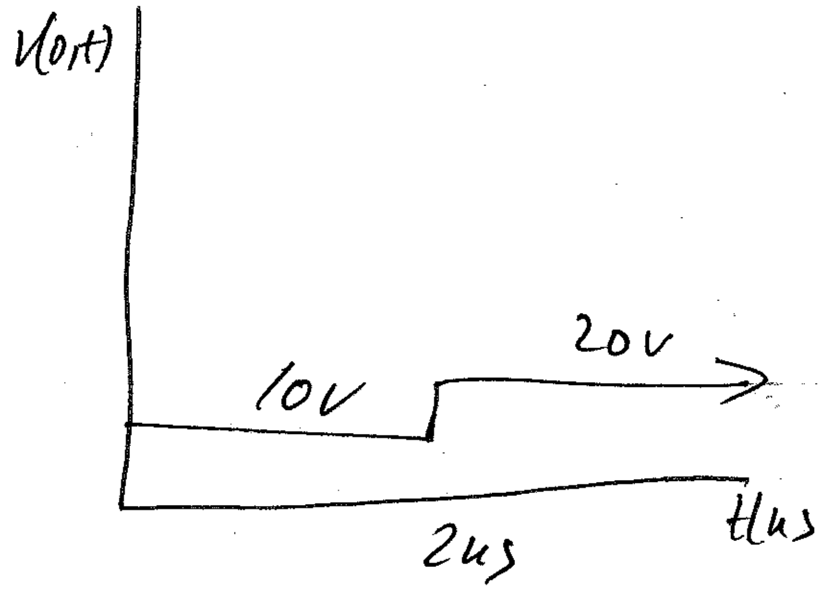
13) For the circuit of Fig. P2-13, plot the voltage v(0,t).

$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{50-50}{50+50} = 0$

$\Gamma_2 = 1$

$t = \frac{d}{v} = \frac{200}{200\ m/\mu s} = 1\ \mu s$

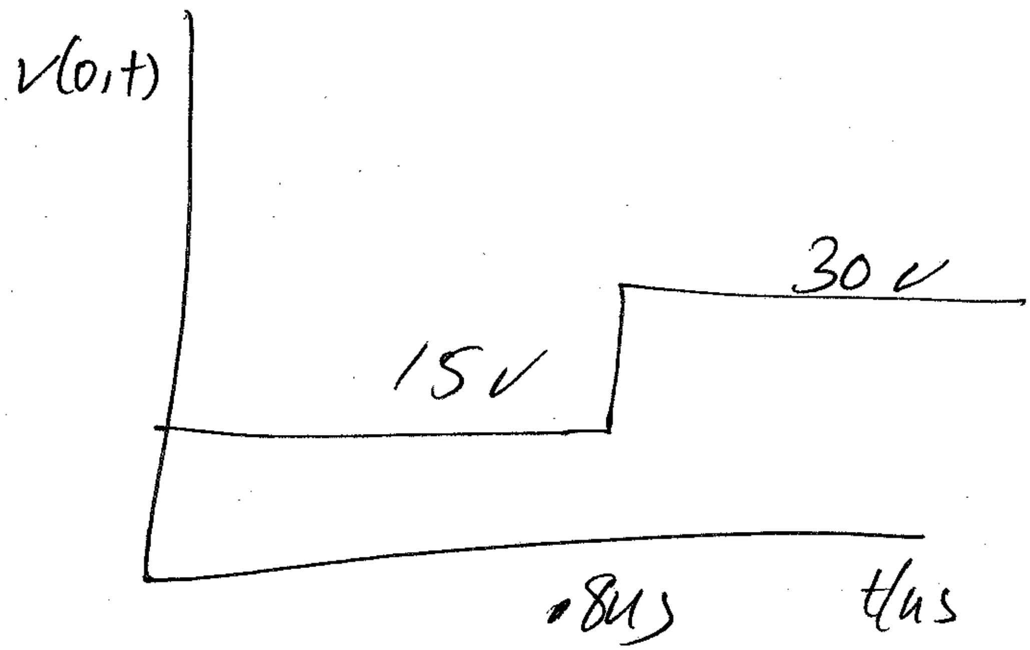


14) For the circuit of Fig. P2-14, plot the voltage v(0,t).

$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{75-75}{75+75} = 0$

$\Gamma_2 = 1$

$t = \frac{d}{v} = \frac{80}{200\ m/\mu s} = .4\ \mu s$



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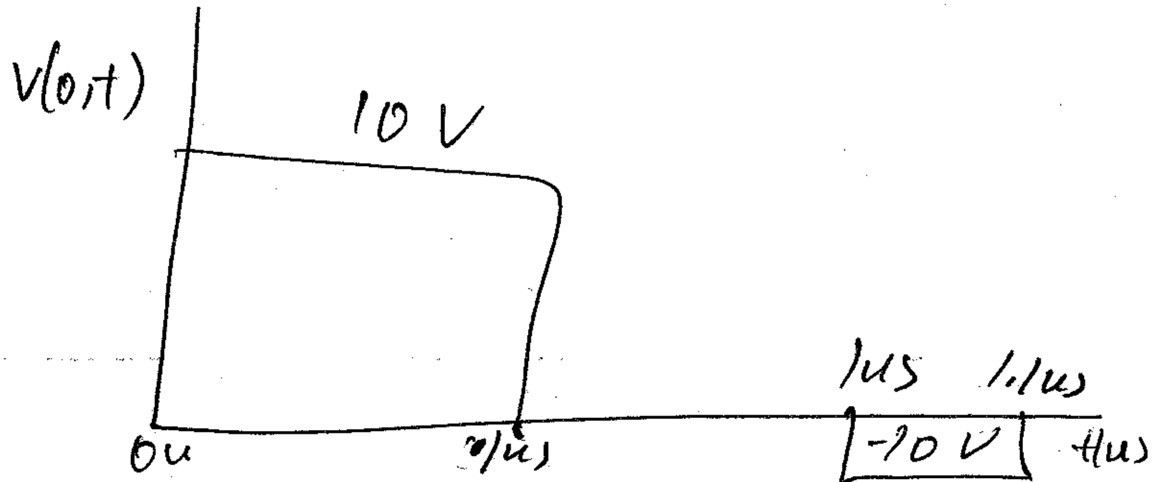
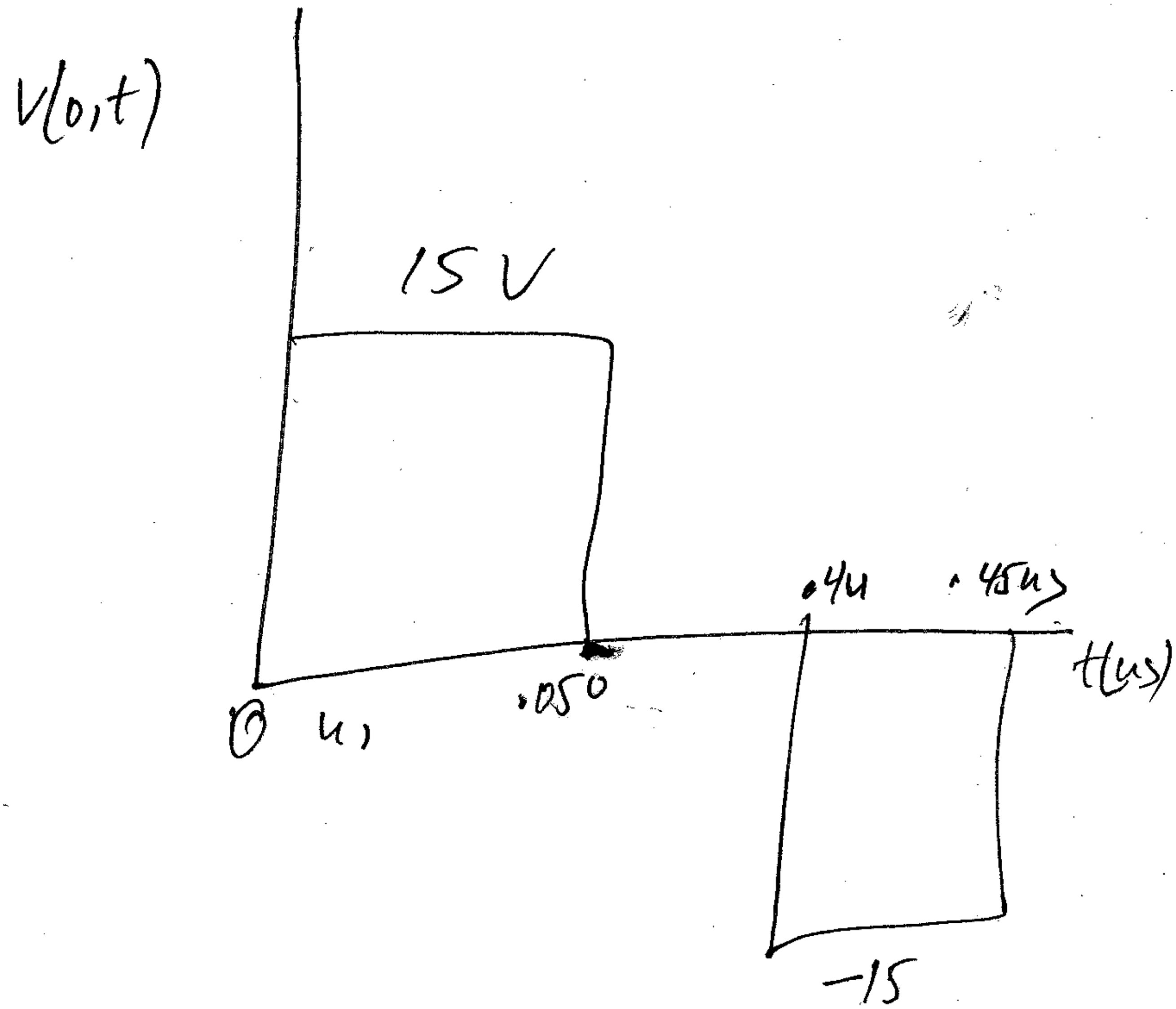
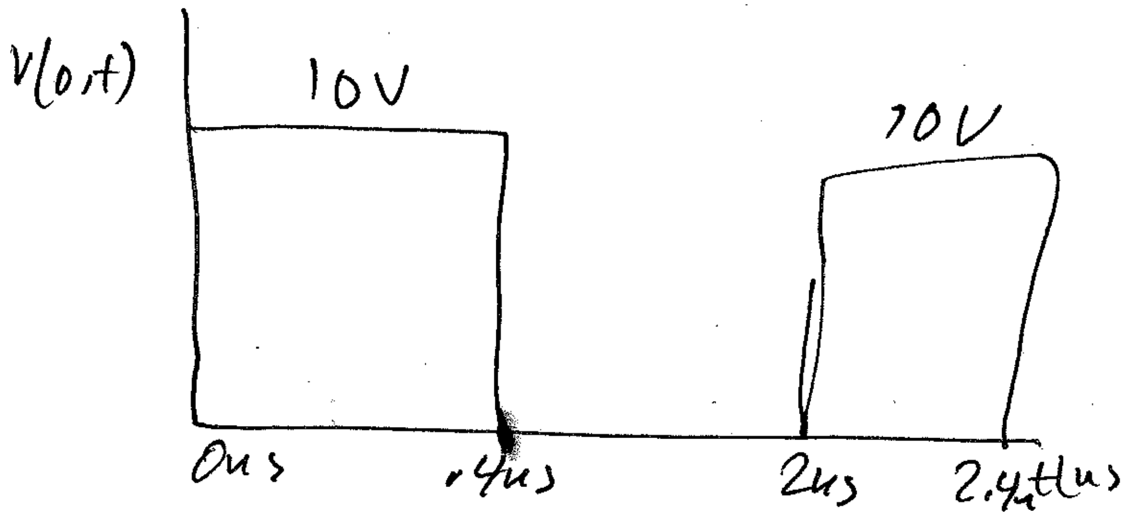
15) For the circuit of Problem 2-11 (Fig. P2-11), assume that the 20-V dc source is replaced by a 20-V pulse of width 0.1 μs starting at t=0. Plot the voltage v(0,t).



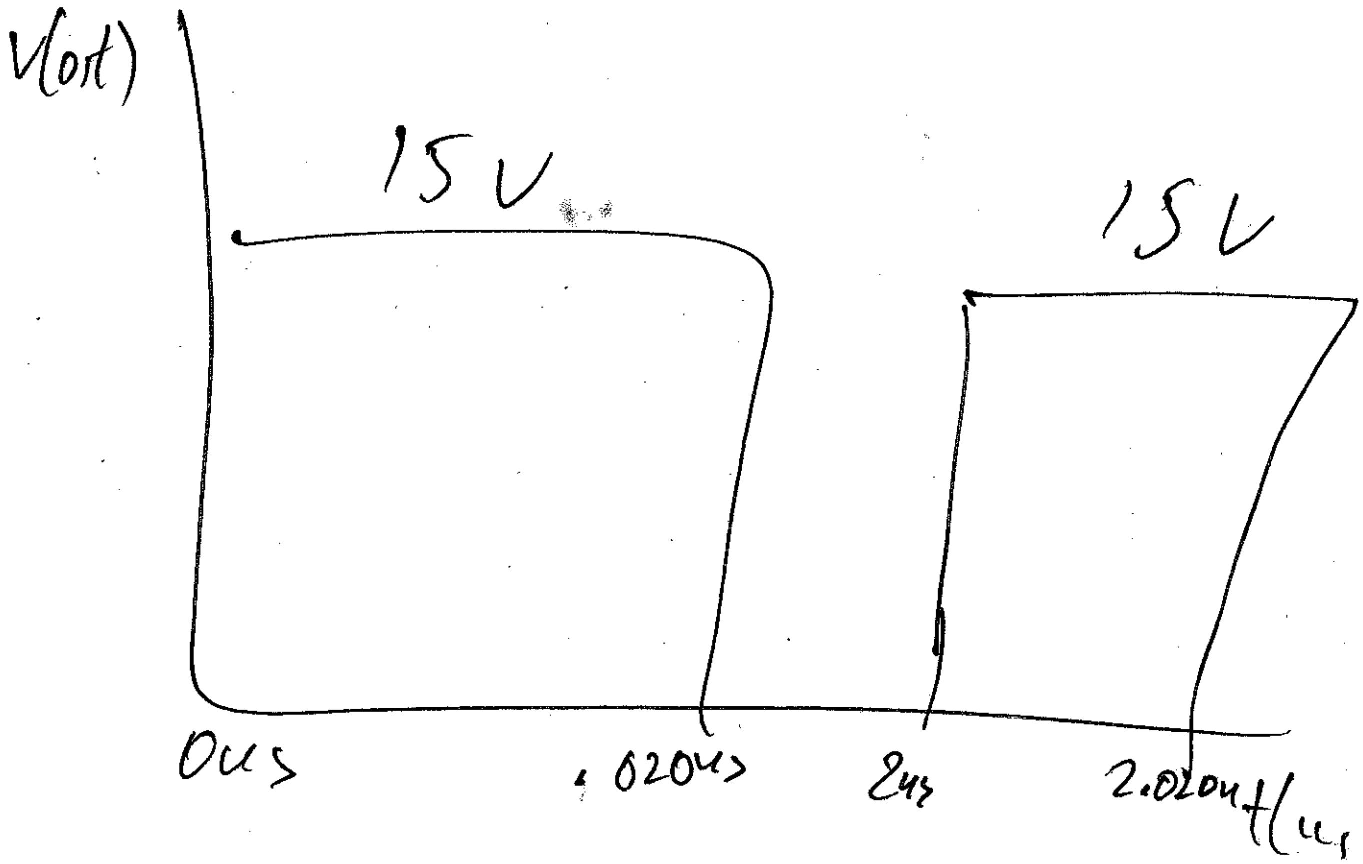
16) For the circuit of Problem 2-12 (Fig. P2-12), assume that the 30-V dc source is replaced by a 30-V pulse of width 50 ns starting at t=0. Plot the voltage v(0,t).



17) For the circuit of Problem 2-13 (Fig. P2-13), assume that the 20-V dc source is replaced by a 20-V pulse width 0.4 μs starting at t=0. Plot the voltage v(0,t).



18) For the circuit of Problem 2-14 (Fig. P2-14), assume that the 30-V dc source is replaced by a 30-V pulse width 20 ns starting at t=0. Plot the voltage v(0,t).

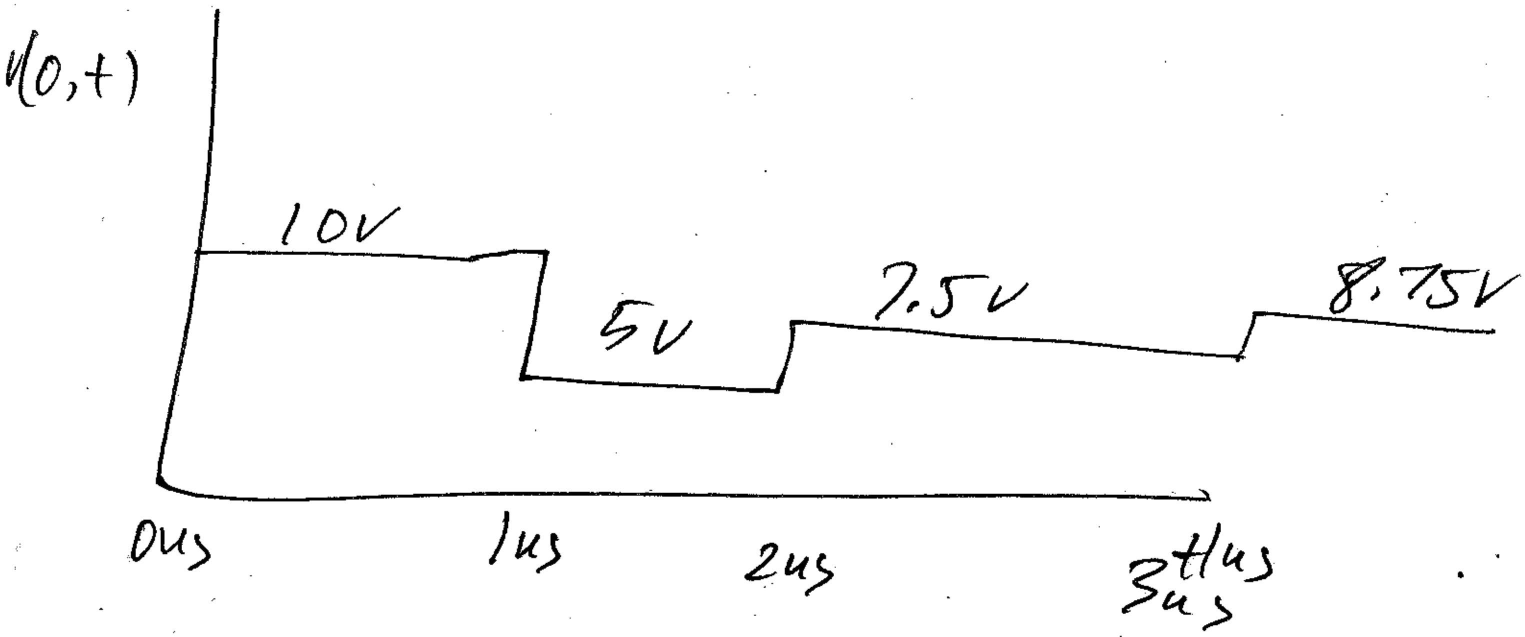


19) For the circuit of Fig. P2-19, plot the voltage v(0,t).

$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{150-50}{50+150} = \frac{100}{200} = .5$

$$\left(\frac{R_0}{R_0 + R_1}\right) * E = \left(\frac{50}{50+150}\right) * 40 = 10\,Volts$$

$t = \frac{d}{v} = \frac{100}{2*10^8\ m/\mu s} = .5\ \mu s$

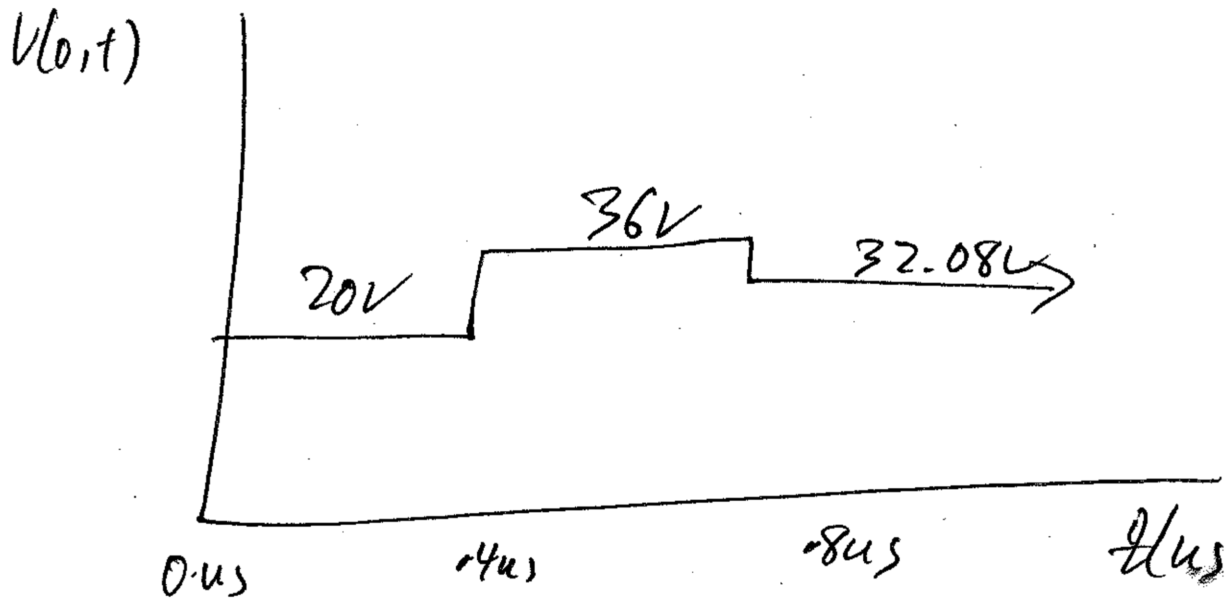


20) For the circuit of Fig. P2-20, plot the voltage v(0,t).

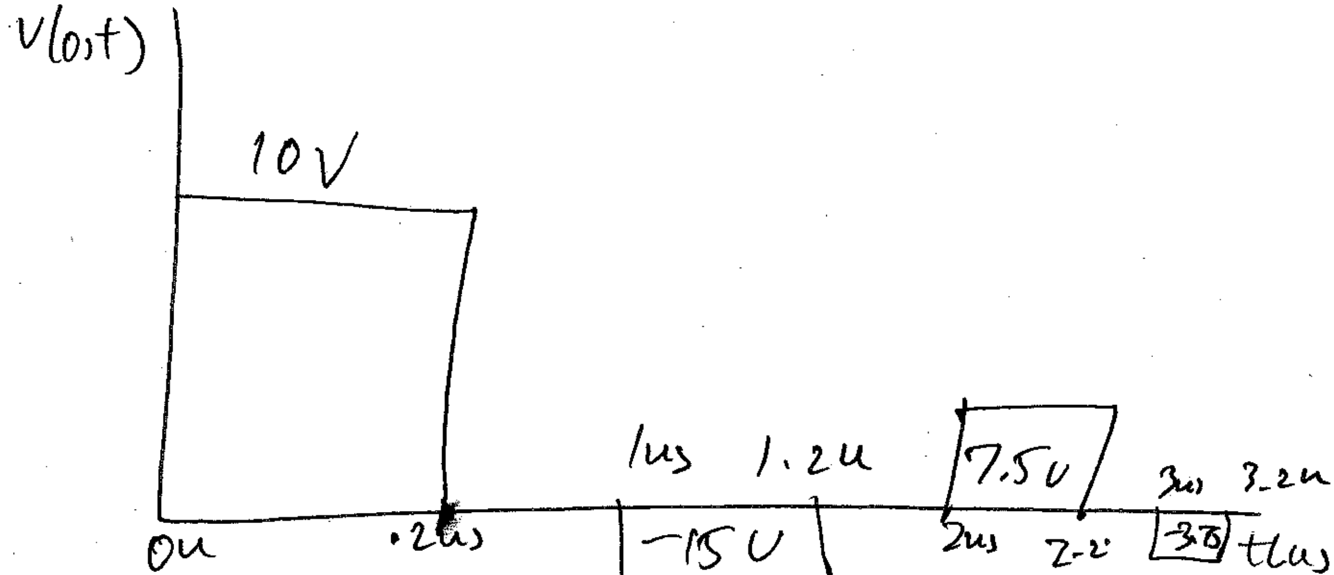
$\Gamma_1 = \frac{R_1 - R_0}{R_0 + R_0} = \frac{25-75}{25+75} = \frac{50}{100} = -.2$

$$\left(\frac{R_0}{R_0 + R_1}\right) * E = \left(\frac{75}{75+25}\right) * 40 = 30\,Volts$$

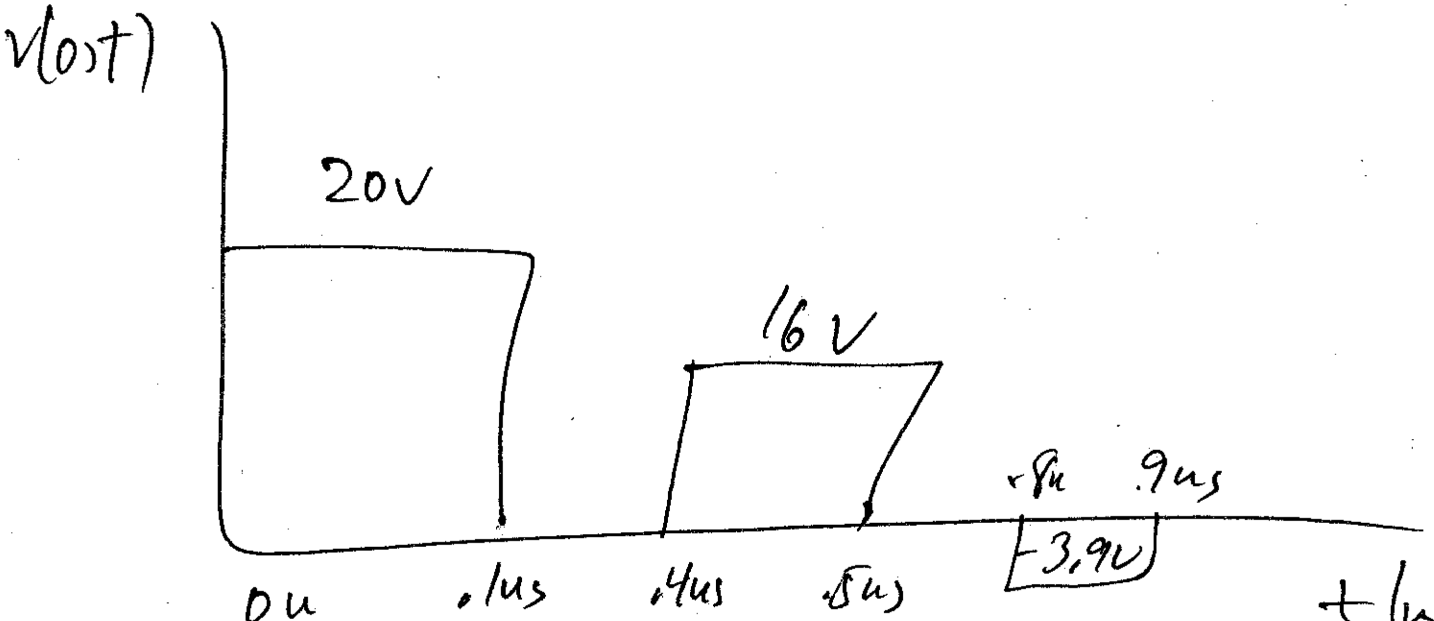
$t = \frac{d}{v} = \frac{40}{2*10^8\ m/\mu s} = .2\ \mu s$



21) For the circuit of Problem 2-19 (Fig. P2-19), assume that the 40-V dc source is replaced by a 40-V pulse width 0.2μs starting at t=0. Plot the voltage v(0,t).



22) For the circuit of Problem 2-20 (Fig. P2-20), assume that the 40-V dc source is replaced by a 40-V pulse width 100 ns starting at t=0. Plot the voltage v(0,t).



23) A 50-Ω line is terminated in an unknown load resistance R_2. The line is excited by a pulse generator with a n output impedance of 50 Ω resistive. The waveform across the input to the line is shown in Fig. P2-23, and the velocity of propagation is 200 m/μs.

a) Determine the length of the line.

$d = v * t_1 = 200 \frac{m}{\mu s} * (.25 * 10^6\ \mu s) = 50\ m$

b) Determine the value of the load resistance.

$r_2 = \frac{24}{40} = .6$

$R_2 = \left(\frac{1+r_2}{1-r_2}\right) * R_0 = \left(\frac{1+.6}{1-.6}\right) * 50 = 200\ \Omega$

24) Repeat the analysis of Problem 2-23 if the voltage across the input is as shown in Fig. P2-24.

$d = v * t_1 = 200 \frac{m}{\mu s} * (1.2 * 10^6\ \mu s) = 240\ m$

$r_2 = \frac{-8}{40} = -.2$

$R_2 = \left(\frac{1+r_2}{1-r_2}\right) * R_0 = \left(\frac{1+(-.2)}{1-(-.2)}\right) * 50 = 75\ \Omega$