EE2002 Tutorial 4

1. Plot the output, v_{out}, of the inverting integrator in Fig. 1(a) using an ideal op-amp if v_{in} is a ramp that levels off at the value $v_{in} = 4$ V after 20 mS as in Fig 1(b). For the inverting integrator, $R_1 = 5$ kΩ and $C = 1$ μF. Assume the initial output is zero and the power supply voltages for the op-amp are ±10V.

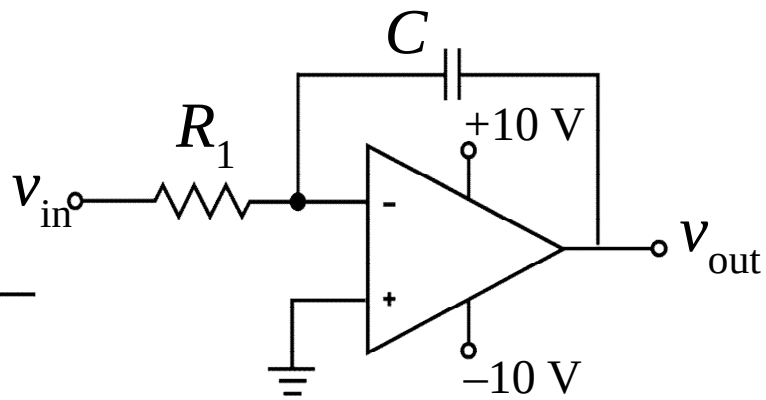


Fig.1 (a)

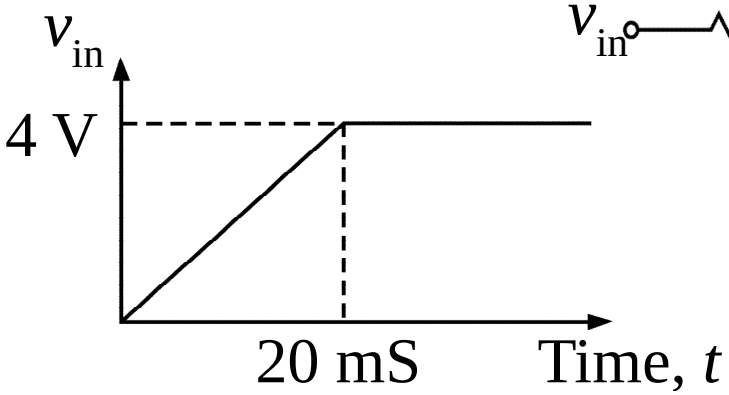


Fig.1 (b)

2. Find the closed loop Gain of the negative feedback opamp circuit, $A_{VCL} = v_o/v_i$ in Fig. 2.

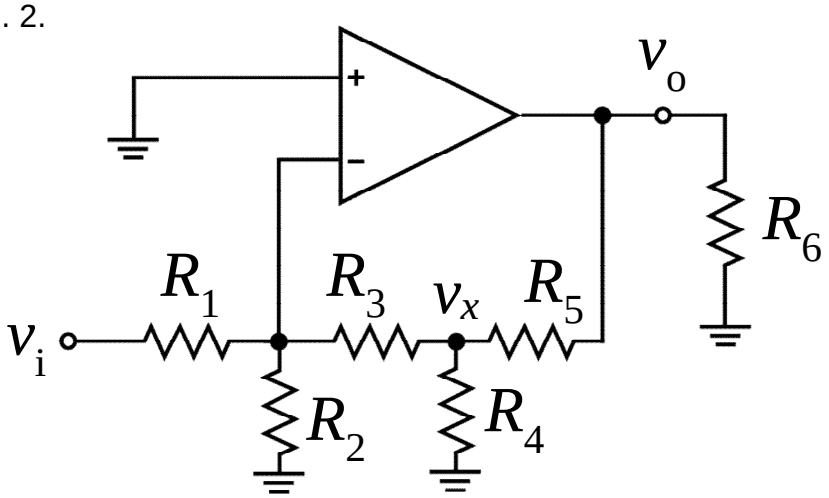


Fig. 2

3. For the circuit in Fig. 3 commonly known as an absolute value circuit, given that R_1, R_2 and R_3 are of the same value R, and R_4 and R_5 are of value 2R. Determine the peak magnitude of v_{out} and also sketch the expected waveform of v_{out} , given that the sinewave input voltage, v_{in} is $2V_{pk\text{-}pk}$ at an arbitrary frequency. The OpAmps are ideal and the diodes are treated in simple diode model with V_D = 0.7V.

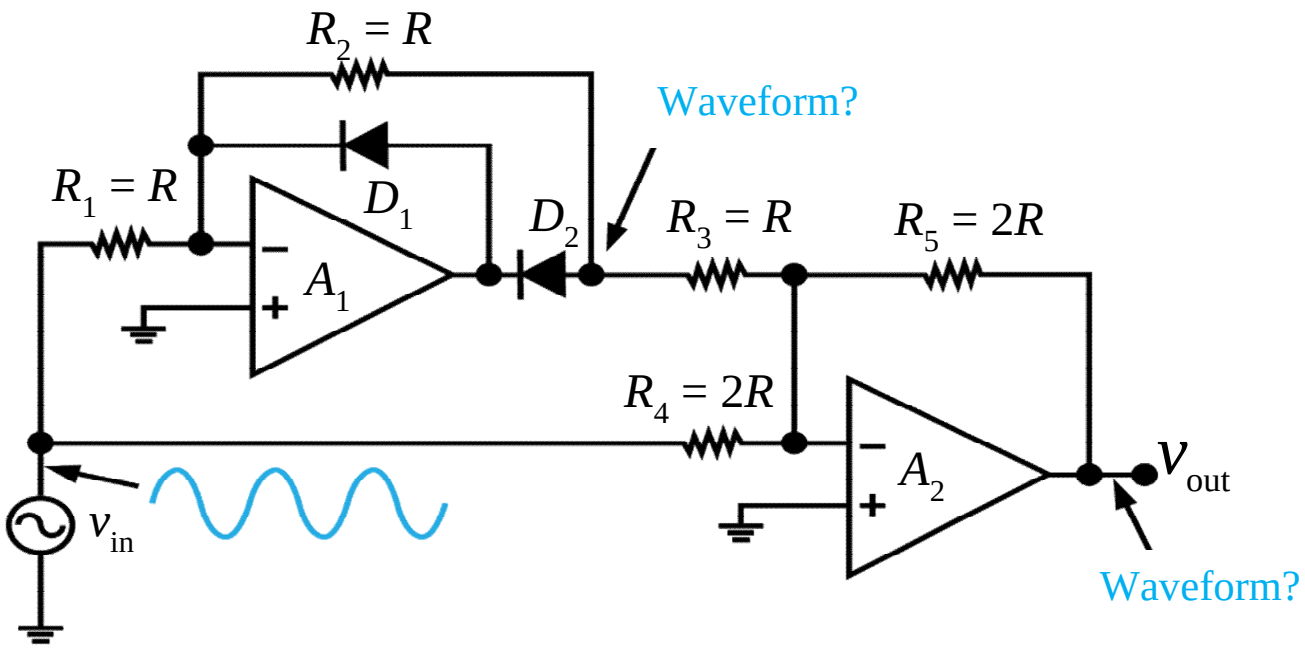
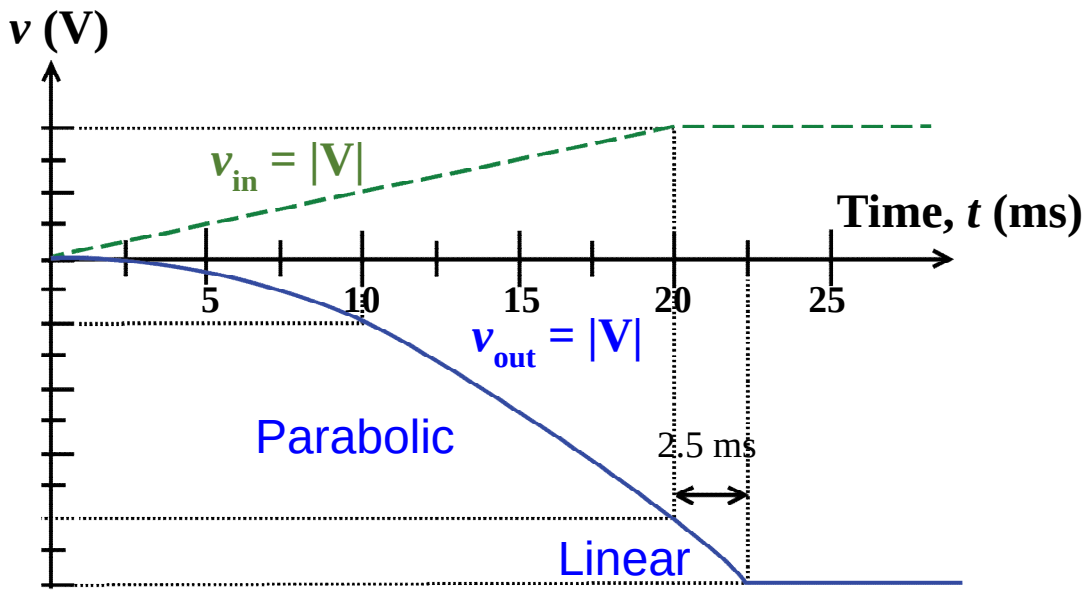


Fig. 3

Answers to Tutorial 4

1.



2.

$$\frac{v_o}{v_i} = -\frac{R_3}{R_1} \times \frac{R_5 + R_3 // R_4}{R_3 // R_4}$$

3.

$v_{out} = |v_{in}|$ = rippled DC output voltage with 1 V peak