

Post Lab 5.

For integrator.

$$Z_{in} = R. \quad Z_{feedback} = \frac{1}{j\omega C} \Rightarrow \text{Gain} = \frac{V_{out}}{V_{in}} = - \frac{Z_{feedback}}{Z_{in}} = - \frac{\frac{1}{j\omega C}}{R}$$

$$= \frac{j}{\omega RC} = \frac{1}{\omega RC} \angle 90^\circ$$

$$|\text{Gain}| = \frac{1}{\omega RC} = \frac{1}{2\pi \cdot (1000) \cdot 1k \cdot 4700p} = \boxed{33.9} \Rightarrow \text{Gain} = 33.9 \angle 90^\circ$$

$$V_{out, rms} = 0.1 V_{rms} \cdot 33.9 = \boxed{33.9 V_{rms}}$$

For differentiator.

$$Z_{in} = \frac{1}{j\omega C}. \quad Z_{feedback} = R. \quad \text{Gain} = \frac{V_{out}}{V_{in}} = - \frac{Z_{feedback}}{Z_{in}} = \frac{-R}{\frac{1}{j\omega C}} = -(j\omega RC)$$

$$= \omega RC (-j) = \omega RC \angle -90^\circ$$

$$|\text{Gain}| = \omega RC = 2\pi \times (1000) \cdot 1k \cdot 0.1 \mu = \boxed{0.6283} \Rightarrow \text{Gain} = 0.6283 \angle -90^\circ$$

$$V_{out, rms} = 0.1 V_{rms} \times 0.6283 = \boxed{63m V_{rms}}$$