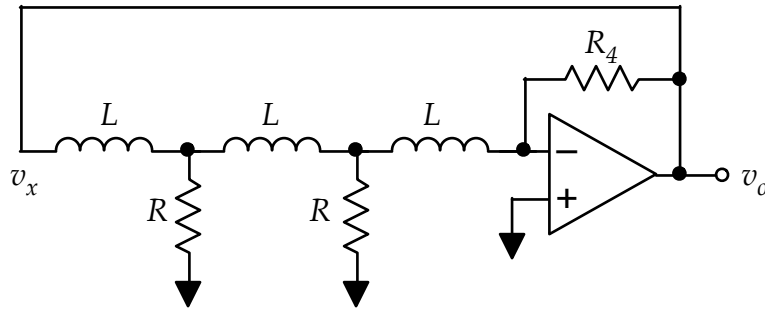


For the phase-shift oscillator circuit shown below, find the expression for the loop gain $A\beta(j\omega)$.



Hint: Conceptually break the circuit at node x . Then work backwards to find v_x in terms of v_o .

Find an expression for the expected oscillation frequency (in terms of R and L) and the minimum value of R_f needed to induce oscillation. (i.e. find the minimum gain needed for the inverting amp.)

For $R = 10 \text{ k}\Omega$ and $L = 1 \text{ mH}$, calculate a value for the oscillation frequency and the minimum R_f needed for oscillation.

$\omega_o =$ _____; R_f (min) = _____