Problem 1: Consider the mystery circuit shown in Fig. 1. Assume that the opamp is ideal (infinite open loop gain, infinite input impedance) with ±5 V power supplies, and that the diode is ideal with a turn-on voltage of 1 V (diode acts as a short circuit for a forward bias of 1 V).

(a) For an input of $V_{in} = \sin(\pi t)$ V, plot the voltages at nodes $V_{out}$ and $V_A$.
(b) What is the opamp output current for $V_{in} = 1$ V?

Figure 1: Mystery circuit.