Problem 1:

Find $V_O$ in terms of the resistors and sources assuming an ideal op-amp. Hint: Use KCL

$$V^+ = V^- = V_R = V_2$$

$$\text{KCL at node A: } i_i + i_F - i_{in} = 0$$

$$\frac{V_1 - V_R}{R_1} + \left[ \frac{V_0 - V_R}{R_F} \right] V_2 = 0$$

$$\frac{V_0}{R_F} = -\left[ \frac{1}{R_1} \right] V_1 + \left[ \frac{1}{R_1} + \frac{1}{R_F} \right] V_2$$

$$V_0 = -\left[ \frac{R_F}{R_1} \right] V_1 + \left[ \frac{R_F}{R_1} + 1 \right] V_2$$

Another on the back.
Problem 2

If $v_s(t) = 10\sin(t)$, find $v_o(t)$ and plot both waveforms. Assume the diode is ideal.

When $v_s > 0$
Diode is reverse biased
Model as open

$V_o(t) = 0$

When $v_s < 0$
Diode is forward biased
Model as short

$V_o = \frac{4V_s}{10+4R}$

$V_o = \frac{4}{5} \cdot 10 \sin(t)$

$V_o = 8 \sin(t)$