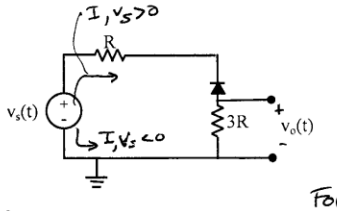
Name SOLUTION

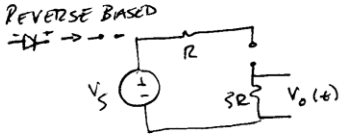
EE301 Dec. 4, 2009
Quiz 10 – No Calculators – **pencil (or pen) and paper only**
Problem 1:

If $v_s(t) = 4\sin(t)$, find $v_o(t)$ and plot both waveforms. Assume the diode is ideal.

$\omega = 1$
$f = \frac{\omega}{2\pi} = \frac{1}{2\pi}$ Hz
$T = 2\pi$ sec/cyc

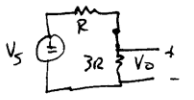


FOR $V_s > 0$
REVERSE BIASED

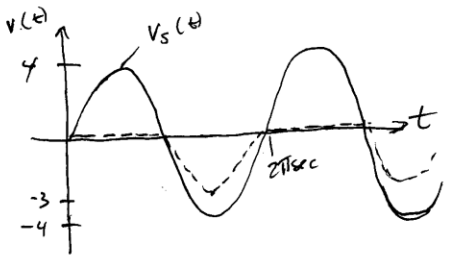


$i_{3R} = 0$
$V_o = 3R \cdot i_{3R} = 0$ V

FOR $V_s < 0$
FORWARD BIASED

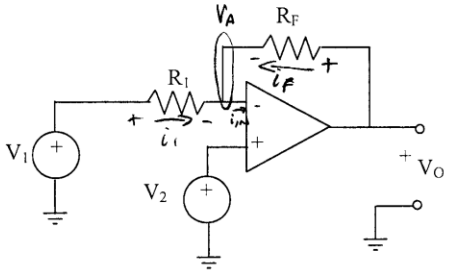


$V_o = \frac{3R}{3R+R} \cdot V_s$
$= \frac{3R}{4R} \cdot V_s = \frac{3}{4} V_s$
$V_o = \frac{3}{4}(4\sin(t)) = 3\sin(t) = V_o(t)$



Problem 2 on back side

Problem 2



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

FOR AN IDEAL OP AMP $\begin{cases} i_{IN} = 0 \\ V^+ = V^- \end{cases}$

$V^+ = V_2$

$V_A = V^- = V^+ = V_2$

KCL @ A

$i_1 + i_F - \cancel{i_{IN}}^{\,0} = 0$

$$\left[\frac{V_1 - V_A}{R_1}\right] + \left[\frac{V_O - V_A}{R_F}\right] = 0$$

$$\frac{V_O}{R_F} = -\left[\frac{1}{R_1}\right]V_1 + \left[\frac{1}{R_1} + \frac{1}{R_F}\right]\overbrace{V_A}^{V_2}$$

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