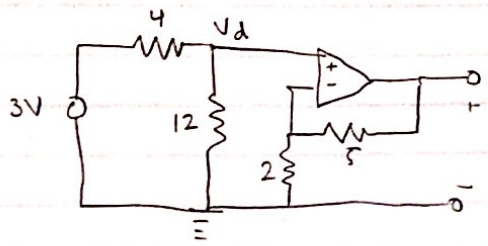
6.



voltage divider $V_d = \frac{12}{12+4} \cdot 3V = \frac{12}{16} = \frac{9}{4} V$

non-inv amp $V_o = V_d\left(1 + \frac{5}{2}\right) = \frac{7}{2} \cdot \frac{9}{4} V = \boxed{\frac{63}{8} V}$

7. $V_o = \frac{R_2}{R_1}\left(1 + \frac{2R_3}{R_4}\right)(V_2 - V_1)$

$= \frac{55k\Omega}{20k\Omega}(1+0)(8.01 - 8.00)$

$= 2.75 \cdot 1 \cdot .01 = \frac{.0275V}{1.k\Omega} = \boxed{27.5\,\mu A}$

4. a) $\xi = x \cdot 10^{-5}$ tons

0 tons $R(0) = \boxed{1\,k\Omega}$

$R(10) = (1 + 20 \cdot 10^{-5}) \cdot 1k\Omega$

$= \boxed{1.0002\,k\Omega}$

$R(50) = (1 + 100 \cdot 10^{-5}) \cdot 1k\Omega$

$= \boxed{1.001\,k\Omega}$

$R(100) = (1 + 200 \cdot 10^{-5}) \cdot 1k\Omega$

$= \boxed{1.002\,k\Omega}$

b) 0 - $V_x = 1.65V$

10 - $V_x = 1.65V$

50 - $V_x = 1.65V$

100 - $V_x = 1.651V$

c) 0 - $V_x = 0$

10 - $V_x = .00016$

50 - $V_x = .00082$

100 - $V_x = .0016$

d) $\frac{V_y}{V_x} = \frac{3V}{.0016V} = \boxed{1875x\,gain}$

e) $D_o = 4096 \cdot \frac{1.5375V}{3.3V} = \boxed{1905.36}$

$D_o = 4096 \cdot \frac{1.5375V}{3V} = \boxed{2097.2}$

Use builtin, stays constant!!

HW4

1. a) 1 bit
   b) $\lceil \log_2 64 \rceil =$ 6 bits
   c) $\lceil \log_2 100 \rceil =$ 7 bits
   d) 0V - 5000mV → $\log_2 5000 =$ 13 bits

2. a) 3.75V - 6V
   b) 90mA - 110mA
   c) 80°C

3. a) $I_{R_1} = 0.0099998$ 0.0299994
   $I_{R_2} = 0.0199996$

   b) $R_{Tot} = \frac{1}{\frac{1}{501\Omega} + \frac{1}{250\Omega}} = 166.78$ $R_{TOT} = \frac{1}{\frac{1}{500} + \frac{1}{251}} =$

   $I_{Tot} = 0.029979961386$ $I_{TOT} = 0.029920417$
   $I_{R_1} = 0.0099932$ $I_{R_2} = 0.0199469$

   c) 0.066% for I_{R_1}
   .26% for I_{R_2}

   d) The resistance is negligible as the measured resistors are all very low resistance.

5. $\frac{120}{5} \cdot 30mV = 24 \cdot 30mV =$ -.72V 30mV/5kΩ = 6μA

8. $\frac{R_2}{R_1}$ ideal op-amp