$$i_D = I_S\left(e^{\frac{V_D}{nV_T}} - 1\right)$$

~~Will shoot for middle of n range so n = 1.5~~

$$i_D = 2 \cdot 10^{-14}\,A\left(e^{\frac{V_D}{1.5(26mV)}} - 1\right)$$

~~.000003~~

~~$rd = \frac{Vd}{Id}$ // syms Vd~~
~~// iD = ...~~
~~// used z = diff(iD)~~
~~// vpa(subs(z, Vd, .4))~~

matlab scripts available :)

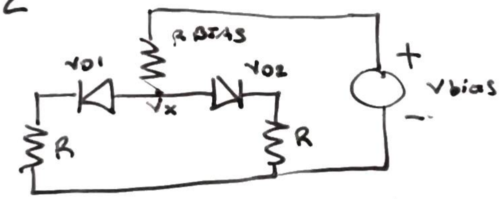
Vd	Id	Rd	Rde	Diff
.4	$9.6047 \cdot 10^{-8}$	$4.1646 \cdot 10^{6}$	$2.707 \cdot 10^{5}$	15.3846
.5	$4.4962 \cdot 10^{-6}$	$1.112 \cdot 10^{5}$	$5.7826 \cdot 10^{3}$	19.2308
.6	$2.1048 \cdot 10^{-4}$	$2.8506 \cdot 10^{3}$	123.5273	23.0769
.7	.0099	71.0435	2.6388	26.9231
.8	.4613	1.7344	.0564	30.7692

~~if using $rd = \frac{nV_T}{I_D}$ then for Vd = .4~~

$$\cancel{rd = \frac{.039}{2 \cdot 10^{-14}\left(e^{\frac{.4}{.039}} - 1\right)}}$$

$$\cancel{rd = 68.509 \cdot 10^{6}}$$

Step 2



$$\frac{V_x - V_{D1}}{R} + \frac{V_x - V_{D2}}{R} + \frac{V_x - V_{bias}}{R_{bias}} = 0$$

$$V_x\left(\frac{2}{R} + \frac{1}{R_{bias}}\right) = \frac{V_{D1} + V_{D2}}{R} + \frac{V_{bias}}{R_{bias}}$$

$$\boxed{V_x = \frac{\frac{V_{D1} + V_{D2}}{R} + \frac{V_{bias}}{R_{bias}}}{\left(\frac{2}{R} + \frac{1}{R_{bias}}\right)}}$$

for Id_1 $\quad Id_1 = \frac{V_x - V_{D1}}{R}$

$$\frac{\frac{V_{D1} + V_{D2}}{R} + \frac{V_{bias}}{R_{bias}}}{\left(\frac{2}{R} + \frac{1}{R_{bias}}\right)R} - \frac{V_{d1}}{R} \Rightarrow \frac{\frac{V_{D1} + V_{D2}}{R} + \frac{V_{bias}}{R_{bias}}}{2 + \frac{R}{R_{bias}}} - \frac{V_{d1}}{R}$$

$$\boxed{\frac{\frac{V_{bias}}{R_{bias}} + \frac{V_{D2}}{R} - V_{D1}\left(\frac{1}{R} - \frac{1}{R_{bias}} - \frac{2}{R}\right)}{2 + \frac{R}{R_{bias}}} = Id_1}$$

$$\boxed{\frac{\frac{V_{bias}}{R_{bias}} + \frac{V_{D1}}{R} - V_{D2}\left(\frac{1}{R} - \frac{1}{R_{bias}} - \frac{2}{R}\right)}{2 + \frac{R}{R_{bias}}} = Id_2}$$

due to symmetry, can swap V_{D2} & V_{D1} for Id_2