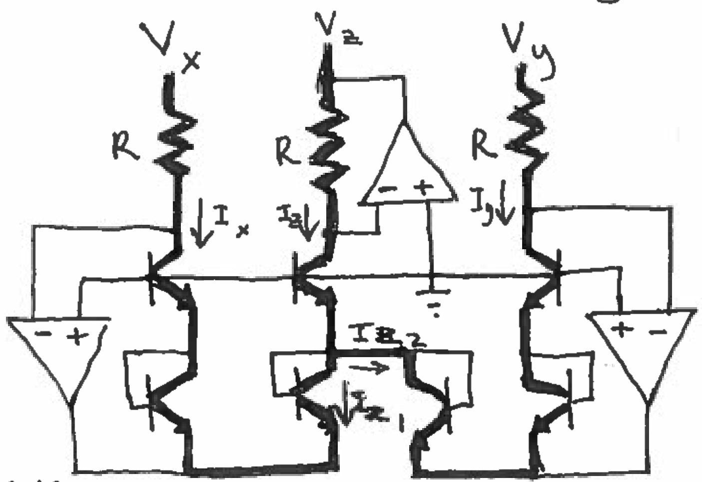
Postlab 1 Ruby Spring Pythagorator: 5/10/15



specifically $V \approx -1.2V$ → ↑ voltage here is < Vground!

it's a pythagorator! cool!

1\. a) Yes, there are restrictions on V_x and V_y because the circuit requires forward active or soft saturation biasing on all the bjts. ~~(~~[illegible]~~)~~ This is possible b/c the noninverting inputs are grounded, which means V_x and V_y must be greater (or equal to) than V_{ground} in order to ~~stay in~~ keep the BJTs in FA or soft saturation.

b) $I_x = \frac{V_x}{R}$, $I_y = \frac{V_y}{R}$, $I_z = \frac{V_z}{R}$

c), d), e), f) →

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$$I_z = I_{z1} + I_{z2}$$

$$I_x^2 = I_z I_{z1}, \quad I_y^2 = I_z I_{z2}$$

$$I_{z1} = \frac{I_x^2}{I_z}, \quad I_{z2} = \frac{I_y^2}{I_z}$$

$$I_z = \frac{I_x^2}{I_z} + \frac{I_y^2}{I_z} = \frac{I_x^2 + I_y^2}{I_z}$$

$$\boxed{I_z = \sqrt{I_x^2 + I_y^2}}$$

g) ~~$V_z = I_z R = \sqrt{(RI_y)^2 + (RI_x)^2} = R\sqrt{I_y^2 + I_x^2}$~~

~~I_z~~

$$I_z = \frac{V_z}{R} = \left(\left(\frac{V_y}{R}\right)^2 + \left(\frac{V_x}{R}\right)^2\right)^{\frac{1}{2}} = \frac{1}{R}\left(V_y^2 + V_x^2\right)^{\frac{1}{2}}$$

$$\boxed{V_z = \sqrt{V_y^2 + V_x^2}}$$