PART 4:

$$V_{D_1} \geq V_{OV_1} \Rightarrow \underbrace{V_{BIAS_2} - (V_{OV_2} + V_{th})}_{V_{GS2}} - V_{OV_1} = 0$$

$$\boxed{V_{BIAS_2} \doteq 50\sqrt{I_{REF}} + V_{th}}$$

$$V_{OV_1} = V_{G_1} - V_{th}$$

$$I_{REF} = \frac{\beta}{2}\left(\frac{W}{L}\right)_1 (V_{G_1} - V_{th})^2$$

$$\sqrt{\frac{2 I_{REF}}{\beta \frac{W}{L}}} = V_{G_1} - V_{th} \doteq V_{OV_1} \doteq 25\sqrt{I_{REF}}$$

$$\frac{I_{REF}}{2} = \frac{\beta}{2}\left(\frac{W}{L}\right)_2 V_{OV}^2$$

$$V_{OV_2} \doteq \sqrt{625 I_{REF}}$$

$$V_{OV_2} = 25\sqrt{I_{REF}}$$