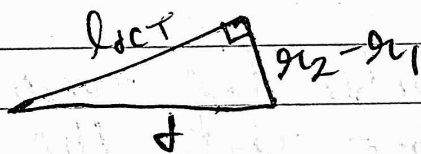
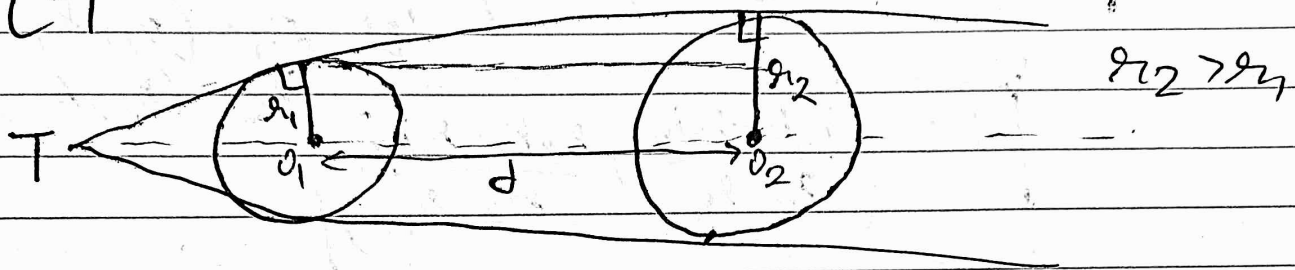


Length of Tangent Trick.

Length of DCT/TCT can easily be calculated without calculating the points of touchings.

DCT

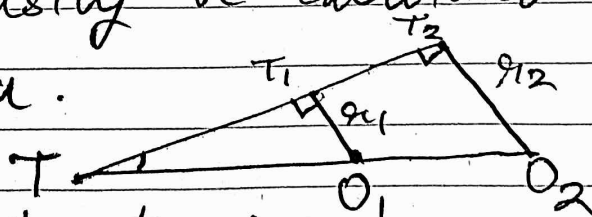


$$l_{DCT}^2 + (r_2 - r_1)^2 = d^2 \quad (\text{Pythagoras})$$

$$l_{DCT} = \sqrt{d^2 - (r_2 - r_1)^2} \quad \text{remember.}$$

Also

Point T can easily be calculated using section formula.



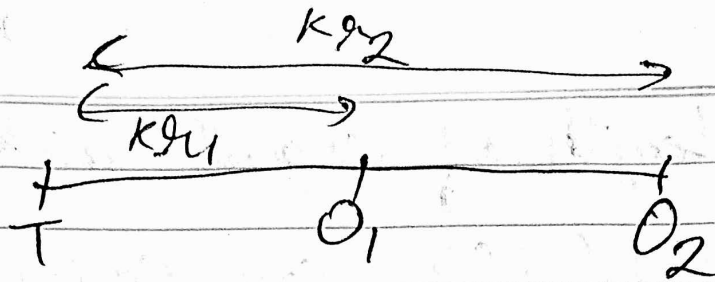
ΔTO_1T_1 similar to ΔTO_2T_2

$$\text{ratio } \frac{TO_1}{TO_2} = \frac{r_1}{r_2}$$

$$r_2 > r_1$$

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$$\vec{T} = \frac{r_2 \vec{O}_1 - r_1 \vec{O}_2}{r_2 - r_1}$$

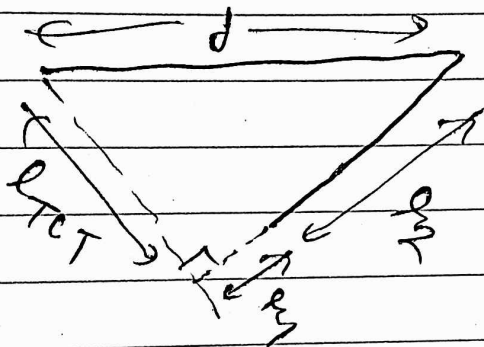
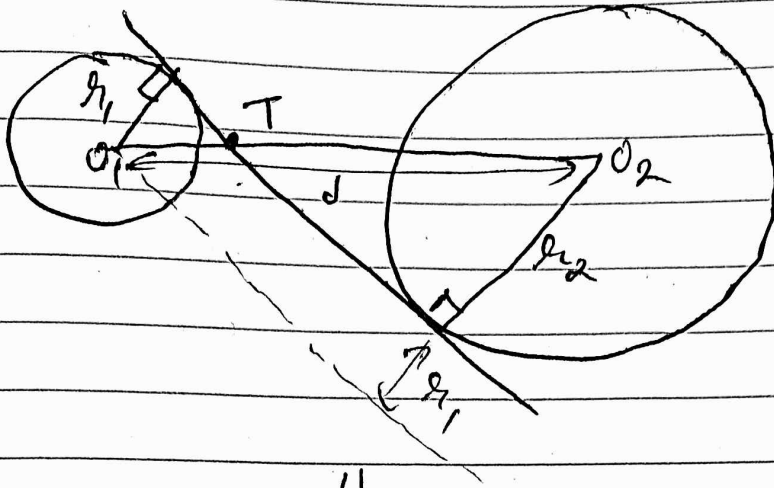
let $O_1 = (h_1, k_1)$
 $O_2 = (h_2, k_2)$

$$\vec{T} = \left(\frac{r_2 h_1 - r_1 h_2}{r_2 - r_1}, \frac{r_2 k_1 - r_1 k_2}{r_2 - r_1} \right)$$

Don't remember the formula.
BUT remember that the poi of Tangent
divides O_1, O_2 externally
in ratio $r_1 : r_2$.

★

TCT



$$r_{TCT}^2 + (r_2 + r_1)^2 = d^2$$

$$r_{TCT} = \sqrt{d^2 - (r_1 + r_2)^2}$$

Similarly here also
T divides O_1O_2 internally in the
ratio $r_1 : r_2$