

Matrices in Geometry 10.7.86

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Question: Let C_1 and C_2 be two circles with C_2 lying inside C_1 . A circle C lying inside C_1 touches C_1 internally and C_2 externally. Identify the locus of center of C .

Solution: Let the center of C , C_1 and C_2 be O , O_1 and O_2 , respectively.

Let the radii of circles C , C_1 and C_2 be r , r_1 and r_2

It is given that C touches the circle C_1 internally and C_2 externally. Therefore,

$$\|O - O_1\| = r_1 - r \quad (1)$$

$$\|O - O_2\| = r_2 + r \quad (2)$$

Adding these two equations, we get

$$\|O - O_1\| + \|O - O_2\| = r_1 + r_2 \quad (3)$$

Substitute O as x

$$\|x - O_1\| + \|x - O_2\| = r_1 + r_2 \quad (4)$$

This is equation of an ellipse because it is of form

$$\|x - S_1\| + \|x - S_2\| = 2a \quad (5)$$

with focii as O_1 , O_2 and length of the major axis as $r_1 + r_2$

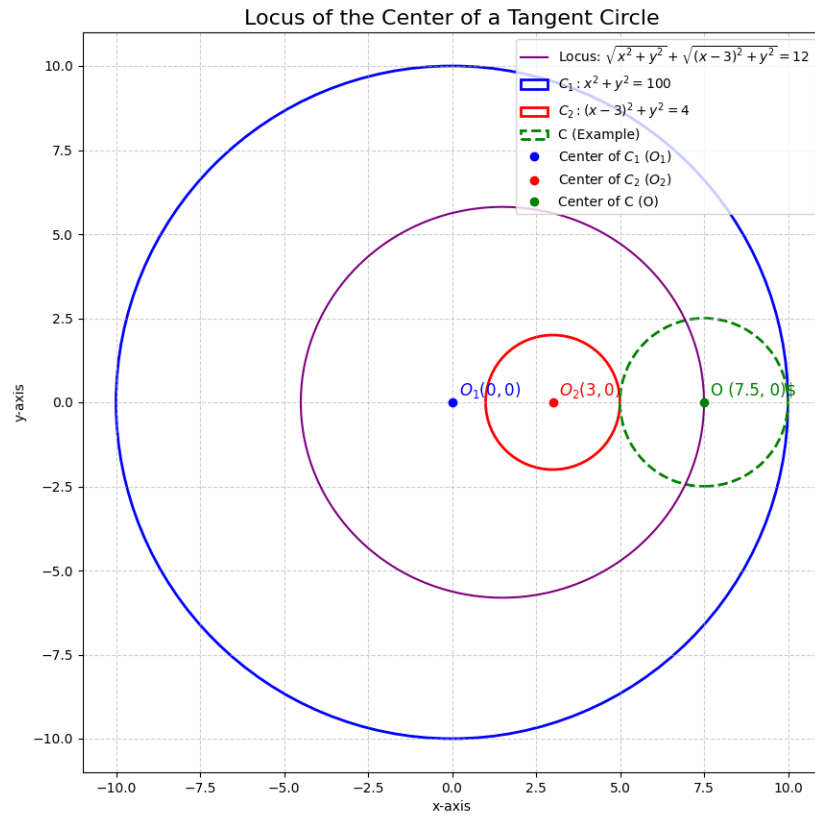


Fig. 1: Graph for 10.7.86