

APPLY LAW COSINE TO  
TRIANGLES INDICATED:

## SOLUTION - TANGENT CIRCLES

$$\begin{aligned} \textcircled{1} \quad (r+1)^2 &= (r+2)^2 + 3^2 - 2(r+2)(3) \cos \theta && - \triangle DOB \\ \textcircled{2} \quad (3-r)^2 &= (r+2)^2 + 1^2 - 2(r+2)(1) \cos \theta && - \triangle DAB \end{aligned}$$

$$\textcircled{2} \quad 9 - 6r + r^2 = r^2 + 4r + 4 - 1 = -2(r+2) \cos \theta$$

SOLVE FOR COS θ

$$\frac{4 - 10r}{-2(r+2)}$$

$$= \cos \theta$$

SUB INTO EQ  $\textcircled{1}$

$$\frac{5r-2}{r+2} = \cos \theta$$

↓

$$\textcircled{1} \quad (r+1)^2 - (r+2)^2 - 9 = -2(r+2)(3) \left( \frac{5r-2}{r+2} \right)$$

$$r^2 + 2r + 1 - r^2 - 4r - 4 - 9 = -30r + 12$$

$$-2r - 12 = -30r + 12$$

$$-24 = -28r$$

$$\frac{24}{28} = r = 0.857$$

