HW Sol'n for §10.4

#38. Find all points of intersection of $r = 1 - \cos\theta$ & $r = 1 + \sin\theta$.

$$1 - \cos\theta = 1 + \sin\theta.$$
$$-\cos\theta = \sin\theta.$$
$$-1 = \frac{\sin\theta}{\cos\theta} = \tan\theta.$$

Now, $\tan\theta = -1$ for $\theta = -\pi/4$ (in $(-\pi/2, \pi/2)$).

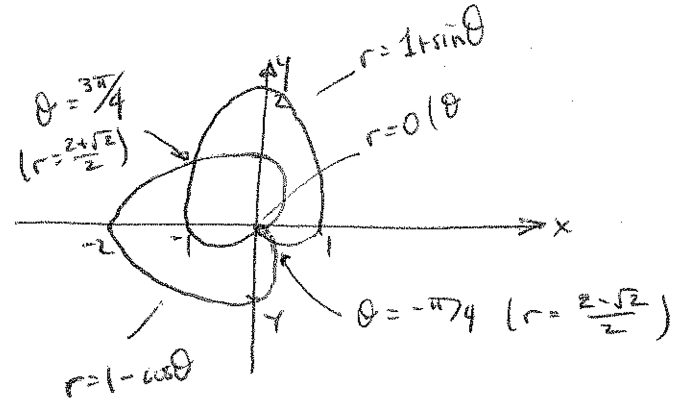
In the next period of the tangent function, $(\pi/2, 3\pi/2)$, $\tan\frac{3\pi}{4} = -1$.

In general, $\theta = -\pi/4 + k\pi$ for any integer k.

To complete this we need to determine the radius at these angles:

$$\theta = -\frac{\pi}{4} : r = 1 - \cos(-\pi/4) = 1 - \frac{\sqrt{2}}{2} = \frac{2-\sqrt{2}}{2} \approx 0.3$$
$$\left\{ r = 1 + \sin(-\pi/4) = 1 + -\frac{\sqrt{2}}{2} = \frac{2-\sqrt{2}}{2} \right\}.$$

$$\theta = \frac{3\pi}{4} : r = 1 - \cos(3\pi/4) = 1 - -\frac{\sqrt{2}}{2} = \frac{2+\sqrt{2}}{2} \approx 1.7$$
$$\left\{ r = 1 + \sin(3\pi/4) = 1 + \frac{\sqrt{2}}{2} = \frac{2+\sqrt{2}}{2} \right\}$$



Note: The two curves both pass through the origin, but not with the same angle, θ. (Recall that the origin is $r = 0$ & any angle θ.)