Graph the curve \( r = 1 - \cos \theta \), \( 0 \leq \theta \leq 2\pi \) in the \( r\theta \)-plane.

In the graph above, focus on the portion of the curve where \( 0 \leq \theta \leq \frac{\pi}{2} \). Notice that, as \( \theta \) varies from 0 to \( 2\pi \), \( r \) is increasing from 0 to 1. In particular, when \( \theta = 0 \), \( r = 0 \), and when \( \theta = \frac{\pi}{2} \), \( r = 1 \); so in the \( xy \) plane, the polar points \((0,0)\) and \((1, \frac{\pi}{2})\) should show up. In between \( \theta = 0 \) and \( \theta = \frac{\pi}{2} \), \( r \) is continuously increasing from 0 to 1, so the portion of the curve where \( 0 \leq \theta \leq \frac{\pi}{2} \) is graphed below in the \( xy \)-plane:

Now examine the graph from the \( r\theta \)-plane graph on the interval \( \frac{\pi}{2} \leq \theta \leq \pi \). Notice that, as \( \theta \) increases from \( \frac{\pi}{2} \) to \( \pi \), \( r \) increases from 1 to 2. In particular, when \( \theta = \pi \), \( r = 2 \); so in the \( xy \) plane, the polar point \((2, \pi)\) should show up. In between \( \theta = \frac{\pi}{2} \) and \( \theta = \pi \), \( r \) is continuously increasing from 1 to 2, so the portion of the curve where \( \frac{\pi}{2} \leq \theta \leq \pi \) is graphed below:
Let’s look at the portion of the $r\theta$-plane graph on the interval $\pi \leq \theta \leq \frac{3\pi}{2}$. As $\theta$ increases from $\pi$ to $\frac{3\pi}{2}$, $r$ decreases from 2 to 1. When $\theta = \frac{3\pi}{2}$, $r = 1$; so in the $xy$ plane, the polar point $(1, \frac{3\pi}{2})$ should show up. In between $\theta = \pi$ and $\theta = \frac{3\pi}{2}$, $r$ is continuously decreasing from 2 to 1, so the portion of the curve where $\pi \leq \theta \leq \frac{3\pi}{2}$ is graphed below:

Finally, we need to look at the portion of the $r\theta$-plane graph on the interval $\frac{3\pi}{2} \leq \theta \leq 2\pi$. As $\theta$ increases from $\frac{3\pi}{2}$ to $2\pi$, $r$ decreases from 1 to 0. When $\theta = 2\pi$, $r = 0$; so in the $xy$ plane, the polar point $(0, 2\pi)$ should show up. In between $\theta = \frac{3\pi}{2}$ and $\theta = 2\pi$, $r$ is continuously decreasing from 1 to 0, so the portion of the curve from $\frac{3\pi}{2} \leq \theta \leq 2\pi$ is graphed below:
The entire curve is graphed below:
1. Graph the curve \( r = 1 + \sin \theta \) in the \( r\theta \)-plane.

2. Use the technique from the previous page to graph \( r = 1 + \sin \theta \) in the \( xy \)-plane.
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3. Graph the curve \( r = \cos(2\theta) \) in the \( r\theta \)-plane.

4. Translate your graph above to the \( xy \)-plane.