Warm-up:

1. Trigonometry review:
   (a) Draw two reference triangles, $30 - 60 - 90$ and $45 - 45 - 90$, and label side lengths and angles in radians.
   (b) What are $\cos(\pi/4)$, $\cos(\pi/6)$, $\sin(\pi/6)$, $\tan(\pi/3)$ and $\tan(\pi/4)$?
   (c) What are $\cos(5\pi/6)$, $\cos(7\pi/6)$, and $\tan(11\pi/6)$?
   (d) Find all angles $\theta$ with $\cos(\theta) = 1/2$.
   (e) Find all angles $\theta$ with $\sin(\theta) = -\frac{1}{\sqrt{3}}$.
   (f) Sketch the graph in the $r, \theta$ plane of $r = \sin(2\theta)$.
   (g) Sketch the graph in the $r, \theta$ plane of $r = 5 - 2\sin(\theta)$.

Problems:

1. Let
   \[ x = \frac{1 - t^2}{1 + t^2}, \quad y = \frac{2t}{1 + t^2}. \]
   (a) Sketch this as $t$ increases from $-2$ to $2$.
   (b) What happens to $x$ and $y$ as $t \to \infty$. What about as $t \to -\infty$.
   (c) show that this parametric curve traces out the circle $x^2 + y^2 = 1$.
   (d) Compute $dy/dx$ for this curve, first by using $x^2 + y^2 = 1$, then using the parametric equations.
   (e) Find an equation for the tangent line to the curve at $t = 2$.

2. Sketch the following parametric curves:
   (a) $x = \sin(4\theta)$, $y = \cos(4\theta)$, $0 \leq \theta \leq \pi/2$
   (b) $x = 2^t - t$, $y = 2^{-t} + t$, $-3 \leq t \leq 3$
   (c) $x = \cos^2(t)$, $y = 1 + \cos(t)$, $0 \leq t \leq \pi$
3. Match the following parametric equations to their graphs

\[
\begin{align*}
    x &= \cos(t), \quad y = \sin(t), \quad 0 \leq t \leq \pi \\
    x &= \cos(2t), \quad y = \sin(2t), \quad 0 \leq t \leq \pi \\
    x &= 3\cos(t), \quad y = 2\sin(t), \quad 0 \leq t \leq 2\pi \\
    x &= 2\cos(t), \quad y = 3\sin(t), \quad 0 \leq t \leq 2\pi \\
    x &= \cos(3t), \quad y = \sin(2t), \quad 0 \leq t \leq 2\pi \\
    x &= t + \cos(2t), \quad y = t + \sin(2t), \quad 0 \leq t \leq \pi \\
    x &= 2\cos^2(t), \quad y = 3\sin^2(t), \quad 0 \leq t \leq 2\pi \\
\end{align*}
\]

Graphs:

- A.
- B.
- C.
- D.
- E.
- F.
- G.
- H.
- I.
- J.
- K.
- L.