

**Problem 1.** Write parametric equations for

- (a) A circle.
- (b) A circle in reverse.
- (c) An ellipse. How do you know that you drew an ellipse?
- (d) A clover-shaped path.

**Problem 2.** Suppose you are standing at  $(0, 0)$  and you want to throw a ball onto a table at  $(10, 5)$  such that the ball rolls across the table without bouncing. How fast and at what angle should you throw the ball?

*Hint: if you throw a ball with initial vertical velocity  $V$  and initial horizontal velocity  $H$ , then the ball will trace the path*

$$x(t) = Ht \quad y(t) = Vt - 5t^2.$$

**Problem 3.** Sketch the curve defined by

$$x(t) = \cos(2t), \quad y(t) = (\cos(t))^2, \quad -\infty < t < \infty.$$

What information can you find out about the curve to help you plot it?

**Problem 4.** Explain why the curve given by

$$x(t) = t(e^t - 1), \quad y(t) = t^2, \quad -\infty < t < \infty$$

does not have horizontal tangents. [Hint: recall l'Hôpital's rule  $\lim_{t \rightarrow a} \frac{f(t)}{g(t)} = \frac{f'(a)}{g'(a)}$ ]