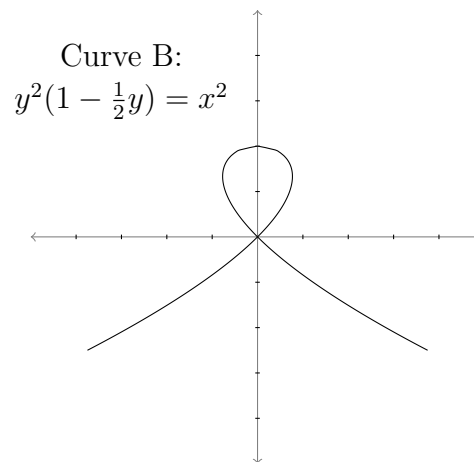
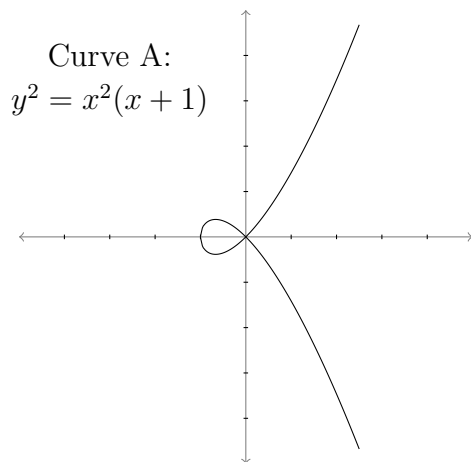


1. Here are two curves defined by equations:



- (a) A cat is at the following location at time t :

$$(x(t), y(t)) = (t^2 - 1, t - t^3).$$

This cat is following one of the two curves. Which one? Explain how you know.

- (b) Which direction does the cat go on the curve? How do you know?
- (c) Find all points on the curve that have a horizontal tangent line. *Hint:* What will be true about $x'(t)$ and $y'(t)$ at a point with a horizontal tangent line?
- (d) At which time(s) t does the cat run through the point $(0, 0)$?
- (e) What are the tangent line(s) to the parametrized curve $(x(t), y(t))$ at $(0, 0)$?
- (f) What is the slowest speed of the cat at any time?
- (g) Set up an integral that computes how far the cat goes when traversing the loop of the curve.

2. Sketch the graph $r = \theta$ for $0 \leq \theta \leq 2\pi$, and find the area bounded by the curve and the first quadrant.
3. Find Taylor series representations of the following functions (you can choose the center):
 - (a) $f(x) = \ln(1 + x)$ (*hint*: what is $f'(x)$?)
 - (b) $f(x) = \int_0^t e^{-x^2} dx$
 - (c) $f(x) = \frac{x^4}{(1 + x)^2}$ (*hint*: start by finding a power series representation for $\frac{1}{(1+x)^2}$)