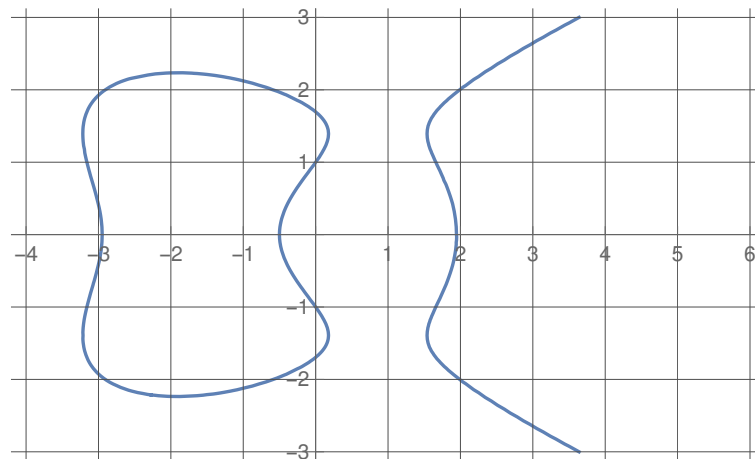


1. **Warm up:** Answer the following True / False questions.
 - (a) If $f(x)$ is constant, then $f(g(x))$ is also constant.
 - (b) If $f'(x)$ and $g'(x)$ are positive, then $\frac{d}{dx}(f(g(x)))$ is positive.
 - (c) An implicitly defined function can always be expressed by two explicitly defined functions.

2. **Elasticity** is a measure of how a variable changes when another variable that it depends on changes.
 - (a) The *force* of gravity depends on the *mass* of the bodies involved and the *distance* between them: $F(m_1, m_2, d) = 6.67 \cdot 10^{-11} \cdot m_1 \cdot m_2 \cdot d^{-2}$.
 - i. Compute the distance elasticity of force, when distance is 10 and 10^{10} .
 - ii. Compute the mass m_1 elasticity of force, when mass m_1 is 10 and 10^{10} .
 - (b) The *demand* of an electric car depends on the *price* of electric batteries that are used in them: $D(p) = 10p(p - 20)(p - 30) + 10^4$.
 - i. Compute the price elasticity of demand when price is 10 and 40.
 - ii. For what prices p will demand be unit elastic?

3. Consider the implicitly defined function $y^2(8y^2 - 31) = (2x + 1)((2x + 1)^2 - 24)$, whose graph is given below.



- (a) Compute the derivative $\frac{dy}{dx}$.
 - (b) Where does the line $x = 0$ intersect the graph? That is, find all points $(x = 0, y)$ that satisfy the implicit equation.
 - (c) Find the slopes of the tangent lines from the points found in part (b).
 - (d) Find the equations of the tangent lines from two of the points found in part (b).
4. Consider the function $f(x) = e^{-x^2 + \ln(x)}$.
 - (a) Find the derivative $f'(x)$.
 - (b) Find the points (x, y) on the graph of f where the tangent line to f is horizontal.
 - (c) Where is the derivative positive? Where is it negative?