Objectives:

- Use calculus to ensure we have accurate graphs when we use computers for assistance.

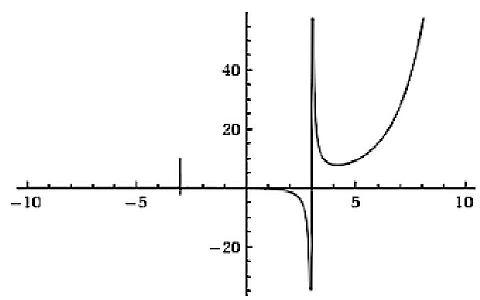
Example: Consider the function $f(x) = \dfrac{e^x}{x^2-9}$. We want to produce a graph of f that shows all interesting characteristics of f. So we want to capture all intervals of increase and decrease, extreme values, intervals of concavity, and inflection points.

First, let's try graphing f online with WolframAlpha:

Input interpretation:

plot	$\dfrac{e^x}{x^2-9}$	$x = -10$ to 10

Plot:



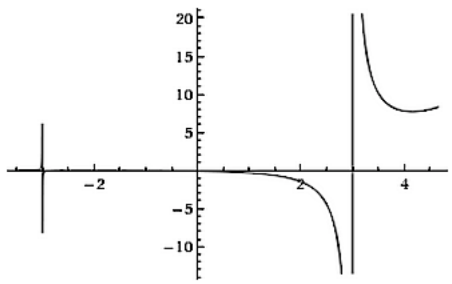
Let's use calculus to do better:

Now what? To find intervals of concavity and inflection points, we need the second derivative.

Input interpretation:

plot	$\frac{e^x}{x^2 - 9}$	$x = -3.5$ to $1.5 + \sqrt{10}$

Plot:

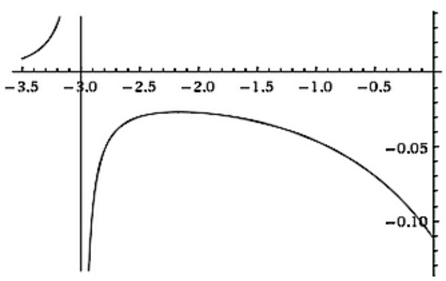


So this is better but not great. It is still hard to see what's going on on the negative axis but we could make multiple graphs to get a better idea:

Input interpretation:

plot	$\frac{e^x}{x^2 - 9}$	$x = -3.5$ to 0

Plot:



Input interpretation:

plot	$\frac{e^x}{x^2 - 9}$	$x = 0$ to $1.5 + \sqrt{10}$

Plot: