Goal: To collect information about the first and second derivatives of a function, then use this information to graph the function without using technology.

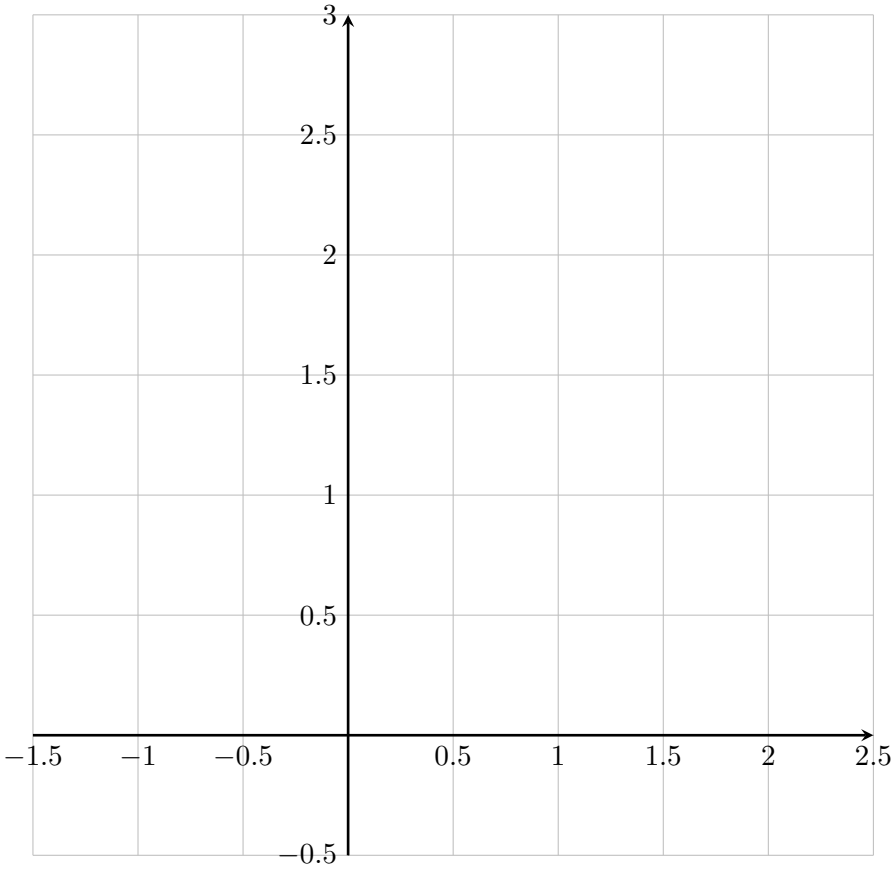
1. Consider the function $f(x) = 3x^4 - 8x^3 + 6x^2$.

   (a) Determine the open intervals on which the function is increasing/decreasing.

   (b) Find the local maxima and local minima of $f(x)$, if any. Be sure to find the critical points, classify them using either the first or second derivative test, then substitute the $x$-values into $f(x)$ to find the local mininum/maximum values.

   (c) Find the inflection points of the function, if any. Be sure to find where the second derivative is zero, use a sign chart to determine whether or not the second derivative changes, then substitute the $x$-values into $f(x)$ to find the $y$-value at each inflection point.

(d) Plot the local extrema and the inflection points on the graph. Transfer the information from parts (a) and (b) to the number lines for $f'(x)$ and $f''(x)$. Sketch the graph of the function $f(x) = 3x^4 - 8x^3 + 6x^2$, using all of the information.



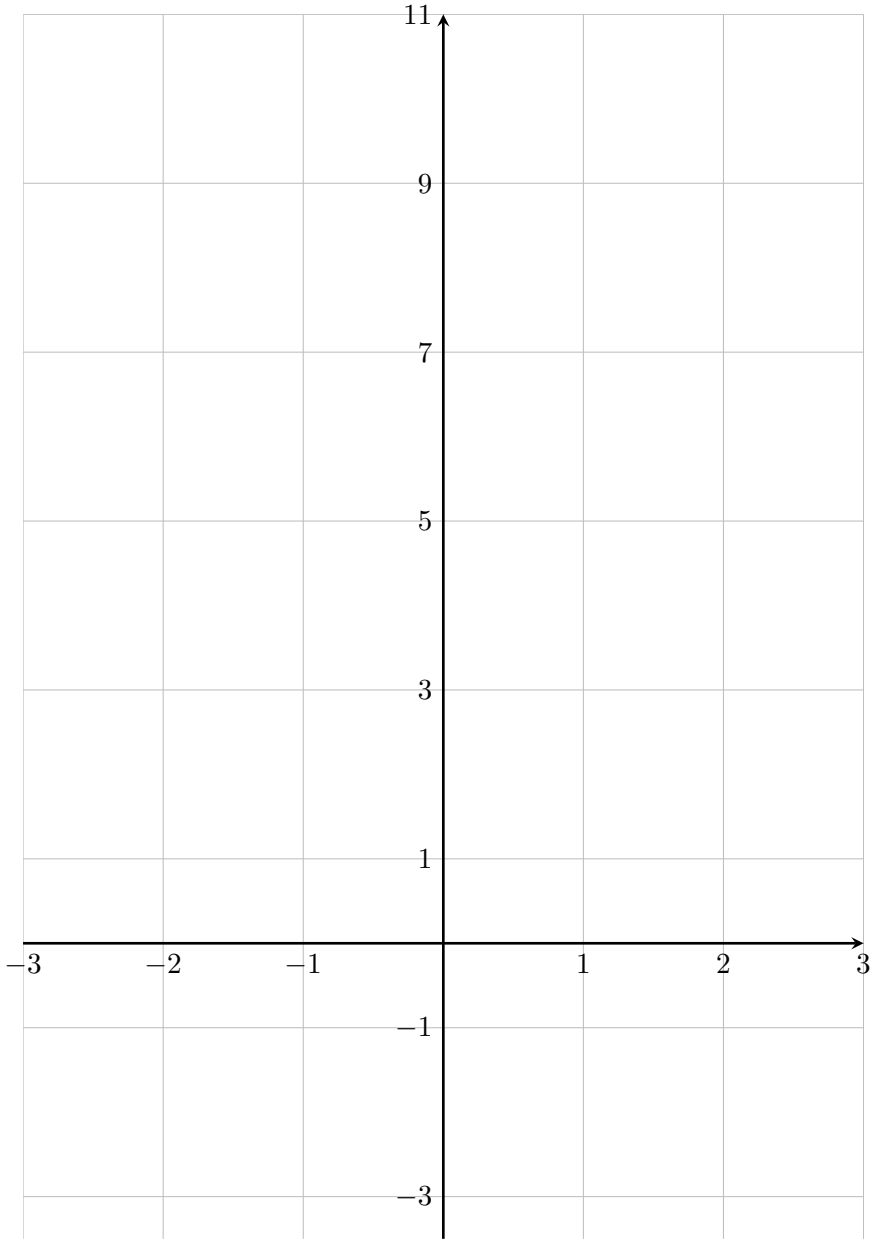

$f'(x)$:

$f''(x)$:

(e) Now use your graphing calculator to get the graph of $y = f(x)$ on this domain, and compare it to the graph you just drew. How well did you do?

2. Using the same process as in the previous problem, graph $f(x) = x^{\frac{1}{3}}(x+4)$ on the next page.

Graph of $f(x) = x^{\frac{1}{3}}(x+4)$




$f'(x)$:

$f''(x)$: