- Margaret and I will be available to help you with the problems. You should also ask your group members questions, and share your ideas with each other.
- Focus on **understanding** the solution each problem, and on being able to **explain** them to each other.

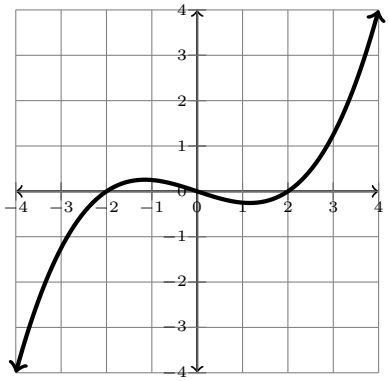
1. Let $f(x) = (x+1)^2(x-2)^3$.
   (a) Compute $f'(x)$ and simplify as much as possible (factor it as much as possible).
   (b) Determine the critical numbers of $f(x)$.
   (c) Find the intervals on which $f(x)$ is increasing and decreasing, and list the x-coordintes of any local min(s) and max(s).

2. Let $g(x) = \dfrac{1}{1-x^2}$.
   (a) Compute $g'(x)$ and simplify your answer.
   (b) Find the critical number(s) of $g(x)$.
   (c) Find the intervals on which $g(x)$ is increasing and decreasing, and list the x-coordinates of any local min(s) and max(s).

3. Let $h(x) = x^{2/3}(2-x)$.
   (a) Compute $h'(x)$, and determine the critical number(s) of $h(x)$ (remember to include values where $h'(x)$ is undefined, not just places where it is 0).
   (b) Determine all local max(s) and min(s) of $h(x)$ (it is enough to state the x-coordinates only, but clearly explain whether it is a max or a min and why).

   Suggestion: You'll end up with an expression with a $x^{-1/3}$ term and a $x^{2/3}$ term. Try writing this as a single fraction with denominator $x^{1/3}$. Ask me or Margaret for help if you are stuck.

4. Shown below is the graph of **the derivative** $f'(x)$ of a function $f(x)$ (this is **not** the graph of the original function $f(x)$).



   (a) Identify the critical numbers of $f(x)$. Only the x-values are needed. (Remember that what you have it the graph of $f'(x)$)

(b) For each critical number you found, determine whether it is a local max, local min, or neither.

(c) Is $f''(-2)$ positive or negative? From this, what can you say about the concavity of the original function $f(x)$ at $x = -2$?

5. Let $f(x) = x^3 + 3x^2 - 1$.

(a) Compute $f'(x)$ and factor it.

(b) Determine the critical numbers of $f(x)$.

(c) Find the intervals on which $f(x)$ is increasing and decreasing, and list any local min(s) and max(s). This time, give **both the x and y-coordinates.**

(d) Compute $f''(x)$.

(e) Find the intervals on which $f(x)$ is concave up and concave down, and list any inflection point(s). Give both x and y-coordinates for these.

(f) Plot the local min(s) and max(s) you found in in parts (5c) and (5e) on the axes below (or on your own sheet of paper). Use these to give a rough sketch of the curve. Make sure it is increasing/decreasing on the right intervals, and concave up/down in the right places.