Test 2 is on Friday, November 30.
Deadline to request accommodations: November 23

Today: Monotonocity.

Homework before Monday’s class:
watch videos 6.1, 6.2.

Homework before Wednesday’s class:
watch videos 6.3, 6.4, 6.5, 6.6, 6.7.
Let \( g(x) = x^3(x^2 - 4)^{1/3} \).

Find out on which intervals this function is increasing or decreasing.

Using that information, sketch its graph.

To save time, here is the first derivative:

\[
g'(x) = \frac{x^2(11x^2 - 36)}{3(x^2 - 4)^{2/3}}
\]
A sneaky function

1. Construct a function $f$ satisfying all the following properties:
   - $f$ is continuous on $\mathbb{R}$
   - $f'(0) = 0$
   - $f$ does not have a local extremum at 0.
   - There isn’t an interval centered at 0 on which $f$ is monotone.

2. Check the function $f(x) = x^2 \sin(1/x)$ for $x \neq 0$ and $f(0) = 0$.
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3. Amend $f$ to get a function $g$ with $g'(0) > 0$, but not increasing on any interval centered as 0.
Find all functions $f$ such that, for all $x \in \mathbb{R}$:

$$f''(x) = x + \sin x.$$
Prove that, for every $x \in \mathbb{R}$

$$e^x \geq 1 + x$$

**Hint:** When is the function $f(x) = e^x - 1 - x$ increasing or decreasing?
Let \( f(x) = \frac{\sin x}{3 + \cos x} \).

Find the maximum and minimum of \( f \).