MAT137

- Test 2 is on Friday, December 2.
- Today: Monotonocity.
- Homework before Wednesday's class: watch videos 6.1, 6.2.

Intervals of monotonicity

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.

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2. Check the function $f(x) = x^2 \sin(1/x)$ for $x \neq 0$ and $f(0) = 0$

Your first integration

Find all functions f such that, for all $x \in \mathbb{R}$:
$f''(x) = x + \sin x$.

Inequalities

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?

From last week: Trig extrema

Let $f(x) = \dfrac{\sin x}{3 + \cos x}$.

Find the maximum and minimum of f.