• **Problem 3:** Consider the following functions defined on all of \( \mathbb{R} \),
\[
f(x) = x^3 - 3x^2, \quad g(x) = \frac{x + 1}{x^2 + 1}.
\]
(i) Are \( f, g \) injective? If not, decompose \( \mathbb{R} \) into intervals on which \( f, g \) are injective. How would one have to choose the codomain of \( f \) and \( g \) so that they are surjective functions? (Of course you need to justify your answer).

• **Problem 4:** (recommended) Use derivatives to show that for \(-\pi/2 \leq x \leq \pi/2\), one has \(|\sin x| \leq |x|\). Interpret the inequality in terms of the graphs of \( \sin x \) and \( x \). *Hint: Remove the absolute values by considering separately the intervals \([-\pi/2, 0]\) and \([0, \pi/2]\).*