

## PRACTICE PROBLEMS

Math 1110 - Instructor: Itamar Oliveira

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1. How many lines are tangent to both of the parabolas  $y = -1 - x^2$  and  $y = 1 + x^2$ ? Find the coordinates of the points at which these tangents touch the parabolas.
2. Show that

$$\frac{d}{dx} \left( \frac{\sin^2 x}{1 + \cot x} + \frac{\cos^2 x}{1 + \tan x} \right) = -\cos 2x.$$

3. If  $f(x) = \lim_{t \rightarrow x} \frac{\sec t - \sec x}{t - x}$ , find the value of  $f'(\pi/4)$ .
4. Find the values of the constants  $a$  and  $b$  such that

$$\lim_{x \rightarrow 0} \frac{\sqrt[3]{ax + b} - 2}{x} = \frac{5}{12}.$$