There are two parts to this assignment. The first part is on WebWorK (accessible through Canvas). The second part consists of the questions on this page. You are expected to provide full solutions with complete justifications. You will be graded on the mathematical, logical and grammatical coherence of your solutions.

Your solutions must be typed or handwritten clearly, with your name, student number and recitation number at the top of the first page. If your solutions are on multiple pages, the pages must be stapled together. Your written assignment must be handed in at the end of your recitation on Friday, November 08. The online assignment will close at 9:00am on Friday, November 08.

**Problem 1.** Let $y \in \mathbb{R}$ be fixed. Consider the two functions

$$g(x) = \sin(x + y), \quad h(x) = \sin(x) \cos(y) + \cos(x) \sin(y)$$

Prove that both functions satisfy the equation

$$f''(x) = -f(x), \quad (x \in \mathbb{R})$$

where $f''(x) = \frac{d^2}{dx^2} f'(x)$ is the second derivative of $f$, and that $g(0) = h(0)$ as well as $g'(0) = h'(0)$. Note: This proves that $g(x) = h(x)$ for all $x \in \mathbb{R}$, which is one of the standard ‘trigonometric identities’.

**Problem 2.** Find the equation of the line tangent to the curve

$$(x^2 + y^2 - 4)^2 = x^3 y$$

at the point $(x, y) = (2, 0)$. 