The Holiday Puzzle

THIS YEAR: A 2024-2025 PROBLEM

Let

$$f_{a,b}(x) = \prod_{j=1}^{b} \cos(\sqrt{2j + (-1)^a}\ x)$$

where a is either 0 or 1 and b is a positive integer. Find all a and b for which $|f''_{a,b}(0)| \in \{2024, 2025\}$. (In other words, the second derivative of $f_{a,b}(x)$ evaluated at 0 should have absolute value 2024 or 2025.)

(The inspiration for this problem will be announced with the solutions.)

On GROUNDHOG DAY, 2025, solutions will be announced and will be posted on the Web at
`http://www.albany.edu/∼martinhi/puzzle.html`
Send solutions to me via e-mail. Due to the department's move, placing them in my physical mailbox (especially in the old location) is not recommended.

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