Problem Set #5

Due Friday, October 30, 2026 @ 12:30 pm
Submit as single pdf file to Canvas

Remember that you need to explain and show the steps in your answers!

1. Let $f(x) = \sqrt{x}\ e^{\tan(x^2)}$. Compute $f'(x)$, and in your solution, identify each time you are using the Product, Quotient, and/or Chain Rule.

2. Let $g(x) = \cos(2x) + \sin(2x)$

   (a) Verify that $g(x)$ has critical numbers at $x = \dfrac{5\pi}{8}$ and $x = \dfrac{9\pi}{8}$
   Note: These are not *all* of the critical numbers of $g(x)$, just two of them.

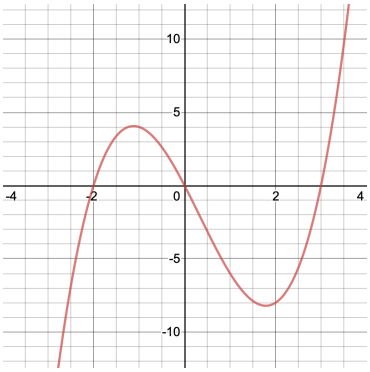
   (b) Use the Second Derivative Test to classify these critical numbers as a local min or local max, if possible.

3. The graph of $f''(x)$ shown below. This is *not* the graph of $f(x)$ or $f'(x)$!

   (a) Where is f concave up? concave down?

   (b) Where does f have inflection points?

   (c) Suppose that $f'(-1) = 0$ and $f'(1) = 0$.
   If possible, classify $x = -1$ and $x = 1$ as local maxima or local minima of f.



Plot of $y = f''(x)$

4. Use the graph of $y = f''(x)$ from #3 to answer the following.

   (a) Suppose that $f'(0) = 0$. Is f increasing or decreasing at $x = 2$? at $x = -1$? Why?

   (b) Suppose that $f'(0) = -1$ and $f(0) = 1$. Is it possible that $f(2) = 3$? Explain.
   Hint: Can you determine if f is increasing or decreasing on $[0, 2]$?