Math 140 Worksheet 5

Week 5: Product Rule, Quotient Rule, Chain Rule, Higher-Order Derivatives

Instructions. Write clear solutions on your own paper. Show enough work to justify your answers. Upload a single PDF of your work to Canvas.

1. Differentiate the following functions.
   (a) $f(x) = x^2 \sin(x)$
   (b) $g(x) = \dfrac{\cos(x)}{x^2 + 1}$
2. Let $h(x) = x^3 - 3x^2 + 2x$.
   (a) Compute $h'(x)$.
   (b) Compute $h''(x)$.
   (c) State where $h(x)$ is increasing/decreasing, state where $h(x)$ is concave up/down.
   (d) Sketch the graph of $h(x)$.
3. Differentiate the function
$$y = \sin(x^2 + 1).$$
4. Let $p(x) = \cos(2x)$.
   (a) Find the equation of the tangent line to $y = p(x)$ at $x = 0$.
   (b) Find all x such that the slope of the tangent line is -2.