1. Find the derivative of each function. Are the solutions what you expected? If not, explain how and why.

   (a) $f(x) = \left(x^4 - 5x^3 + 3x^2 - 5x + 1\right)\tan x$

   (b) $p(t) = \dfrac{t^2 + 3t - 7}{t^2 - 1}\sin^2 t$

   (c) $g(\theta) = \theta^2 \sec\left(\theta^2 - 2\theta + 1\right)$

2. Use the functions from problem 1 to find the instantaneous rate of change for the function at the given value. (Express the solutions in a *reasonable* form.)

   (a) $f(x)$ when $x = 2$

   (b) $p(t)$ when $t = \pi/3$

   (c) $g(\theta)$ when $\theta = 0.56$

3. Given $f(x) = \dfrac{1}{8}x^4 - \dfrac{1}{3}x^3 - \dfrac{1}{2}x^2 + 11x - 5.$

   (a) Graph f and its first, second, third, and fourth derivatives on the same coordinate plane. Show an appropriately labeled legend.

   (b) What is true about the function f when the first derivative is negative?

   (c) What is true about the first derivative when the second derivative is positive?

   (d) How do the relationships between the graphs of each succeeding derivative illustrate the expected result from the Power Rule?

4. Given $g(x) = \left(x^3 - x - 6\right)\sin\left(\dfrac{6x}{7}\right)$ on $[-\pi, \pi]$.

   (a) Determine the coordinates of all points where g has horizontal tangents in the given interval.

   (b) Determine the coordinates of all points in the given interval where the slope of a tangent line to the graph of g is -5.

   (c) Graph $g'(x)$ and $y = -5$ on the same plot over the interval $[-\pi, \pi]$ and use this graph to argue that you found the correct number of points in part (b).

5. Given $R(t) = \dfrac{t^4 - t^3 + 5t^2 - 3t + 1}{3 - t^3}$.

   (a) Determine the slope of the tangent line to the graph of R when $t = 1, 2.1,$ and 5.17.

   (b) Determine the interval(s) when the second derivative of R is negative.