1. Find the derivatives of the following functions. You do **not** need to simplify your solutions.

   $g(x) = \dfrac{1}{\sqrt[3]{x + \sqrt{x}}}$

2. Consider the graph of $y = 10x^3 - x^5$.

[4 points] (a) List the intervals on which this function is increasing.

[1 point] (b) Give the x-coordinates of all local minima, or say that there are none.

[1 point] (c) Give the x-coordinates of all local maxima, or say that there are none.

[4 points] (d) List the intervals on which this function is concave up.

[2 points] (e) List the x-coordinates of all inflection points.

[8 points] 3. (a) Find the slope of the tangent line to the curve defined by

$$x^2y + y^4 = 4 + 2x$$

at the point $(-1, 1)$.

[8 points] (b) Using linear approximation, estimate a y-value on this curve when $x = -0.9$.

[12 points] 4. Find the minimum and maximum value taken by the function $f(x) = 2\sqrt{x} - x$ in the interval $[0, 3]$.