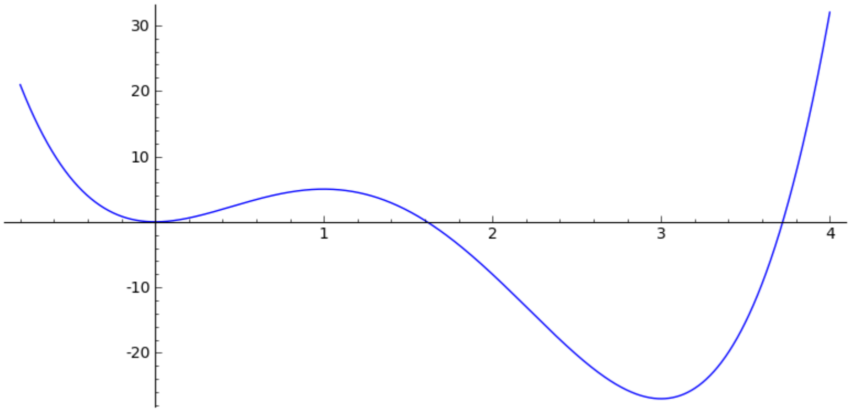
1. Find the absolute maximum and minimum values of $f(x) = x^3 - 6x^2 + 9x + 2$ over the interval $[0, 2]$.

2. Find the absolute maximum and absolute minimum values of $f(x) = \frac{x^3-2}{x^3+2}$ over the interval $[-1, 3]$

3. Sketch the graph of $f(x) = \frac{x}{1+x^2}$. Clearly indicate the location of all axis intercepts, asymptotes, and local extrema.

4. The graph of the derivative of a function ($y = f'(x)$) is shown.



a) At what value(s) of x does the function f have a local maximum?

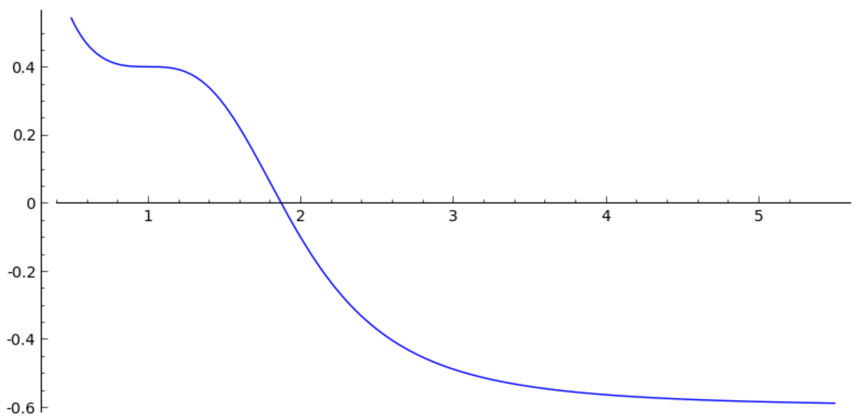
d) On what interval(s) is the graph of the function $y = f(x)$ concave downward?

5. Find the interval(s) on which the function $f(x) = 2 + 3x^2 - x^3$ is concave upward.

6. Let $g(x) = \sqrt{1 - x^2}$. Use the Mean Value Theorem to show that $g'(c) = 1$ for some c in the interval $[-1, 0]$ or explain why the Mean Value Theorem does not apply.

7. Use Newton's method with initial approximation $x_1 = -1$ to find the second approximation, x_2, of a solution to the equation $x^5 + 2 = 0$.

8. Explain why $x_1 = 1$ is a poor starting guess when Newton's method is used to find the root of the function whose graph is shown.



9. Find the most general form of an antiderivative of $f(x) = \sqrt{x} - \frac{2}{x^2}$

10. A particle in a magnetic field has velocity $v(t) = \sin t$ m/s and at time 0 its position is 0. Find a function giving the position of the particle at time t.

11. Find the dimensions of a rectangle with perimeter 80m whose area is as large as possible. Verify that your answer is a maximum.

12. A box with square base and an open top is to have a volume of 10m^3. Material for the base costs \$10 per square meter and material for the sides costs \$8 per square meter. Determine the dimensions of the cheapest such container. Verify that your answer is a minimum.