3.3: Global Optimization Worksheet

1. A weight is hung on a series of springs and a strobe light is flashed and a camera records the height above the floor in feet for the weight every half second while the weight bounces. That information is given in the table below.

time	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
height	2.54	4.65	7.08	8.80	9.17	8.19	6.57	5.26	5.00	5.88	7.30

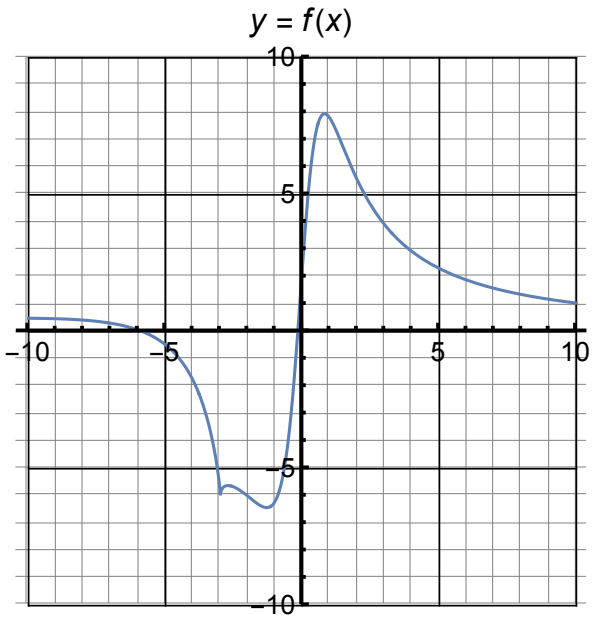
time	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
height	8.33	8.17	6.64	4.27	2.04	0.86	1.12	2.49	4.09	5.00

1.1. Estimate the greatest distance from the floor during this time. Approximately at what times is the maximal distance reached?

1.2. Estimate the smallest distance from the floor during this time. Approximately at what times is the minimal distance reached?

1.3. Plot the points. Assuming that the motion is periodic, and that you have witnessed at least one period, what is your estimate for the period of the motion? How many local (non-global) extrema might you identify?

2. The following questions all refer to the graph $y = f(x)$ given below. Estimate your results from the graph.



2.1. On the closed and bounded interval [0, 5].

2.1.1. What are the critical numbers inside this interval?

2.1.2. What is the maximum value of $f(x)$? For what values of x is this maximum value attained?

2.1.3. What is the minimum value of $f(x)$? For what values of x is this minimum value attained?

2.2. On the closed and bounded interval $[-6, 0]$.

2.2.1. What are the critical numbers inside this interval?

2.2.2. What is the maximum value of $f(x)$? For what values of x is this maximum value attained?

2.2.3. What is the minimum value of $f(x)$? For what values of x is this minimum value attained?

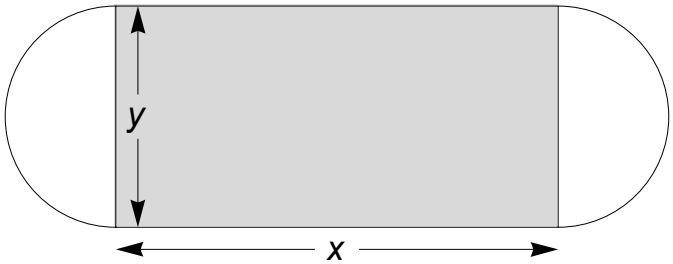
3. Let $g(x) = \frac{x^2+3x}{x^2+x+2} + 5$.

3.1. Show that $g'(x) = -2\,\frac{(x+1)(x-3)}{(x^2+x+2)^2}$.

3.2. For x-values in the interval $[0, 5]$, what is the maximum value of $g(x)$? For what values of x is this maximum attained?

3.3. For x-values in the interval $[0, 5]$, what is the minimum value of $g(x)$? For what values of x is this minimum attained?

4. A local high school is designing a new sports field. Its shape is rectangular with two semicircles at the opposite sides.



The field needs to have a 400 meter track around its perimeter. What are the dimensions x and y that make the area of the field as large as possible while maintaining the 400 meter perimeter?