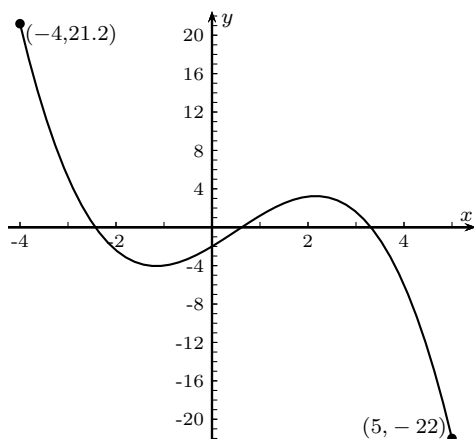


Precalculus, Section 2.3, #58
Properties of Functions

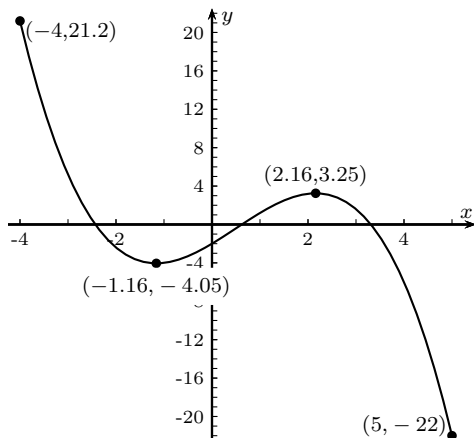
Use a graphing utility to graph the function over the indicated interval and approximate any local maximum values and local minimum values. Determine where the function is increasing and where it is decreasing. Round answers to two decimal places.¹

$$f(x) = -0.4x^3 + 0.6x^2 + 3x - 2 \quad (-4, 5)$$

Whether we use a graphing calculator, a computer program, or an online graphing utility, the graph of the equation on the interval $(-4, 5)$ is shown below.



Using the `calc:minimum` function on the TI-83 (or whatever graphing calculator is available), we find the local minimum of ≈ -4.05 occurs at $x \approx -1.16$. Similarly, the local maximum of ≈ 3.25 occurs when $x \approx 2.16$.



From the graph, we can see the function is decreasing on the interval $(-4, -1.16)$, increasing on $(-1.16, 2.16)$, and decreasing on $(2.16, 5)$.

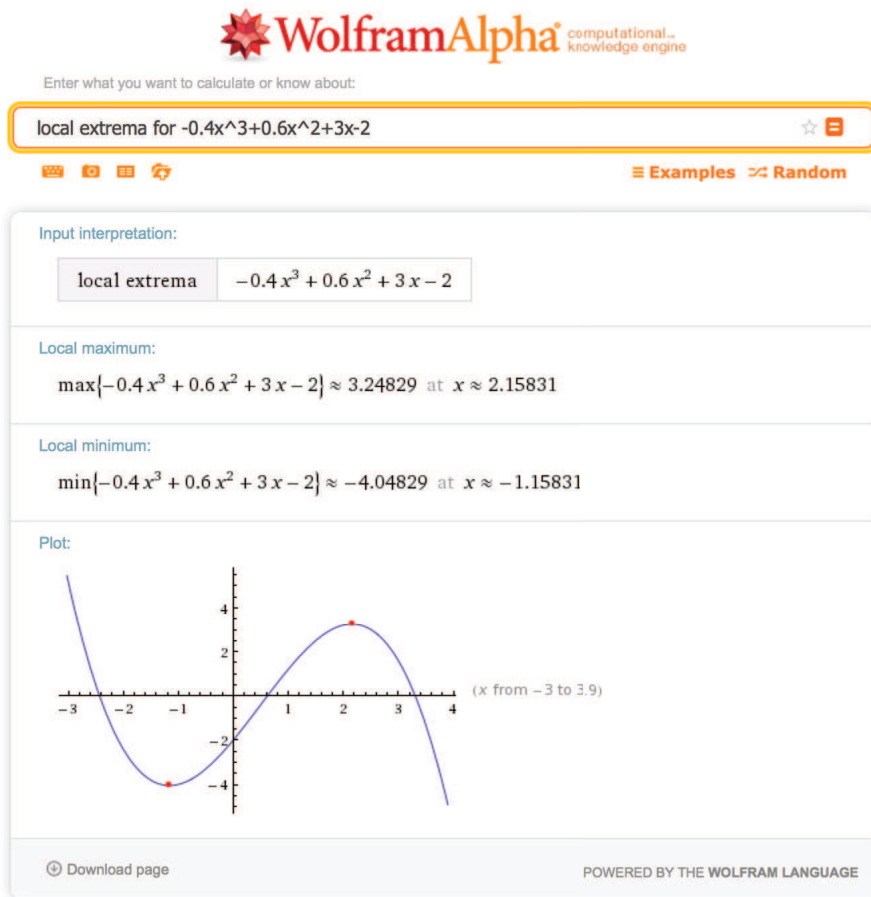
When we used the `calc:minimum` function to find the local minimum, the values were approximations. Very accurate approximations, but approximations nevertheless. To find the exact value, we need to use concepts and techniques that we'll learn in calculus. The same is true for `calc:maximum`.

¹Sullivan, *Precalculus: Enhanced with Graphing Utilities*, p. 90, #58.

Precalculus

Properties of Functions

Here is the input and result when we use WolframAlpha for this problem.



The image shows a screenshot of the WolframAlpha website. At the top, the WolframAlpha logo is displayed with the tagline "computational knowledge engine". Below the logo, there is a search bar containing the text "local extrema for $-0.4x^3 + 0.6x^2 + 3x - 2$ ". To the right of the search bar are icons for a star and a menu. Below the search bar, there are icons for various input methods and the text "Examples" and "Random".

The main content area is titled "Input interpretation:" and shows the input "local extrema" and the function $-0.4x^3 + 0.6x^2 + 3x - 2$. Below this, the results are displayed:

Local maximum:
 $\max\{-0.4x^3 + 0.6x^2 + 3x - 2\} \approx 3.24829$ at $x \approx 2.15831$

Local minimum:
 $\min\{-0.4x^3 + 0.6x^2 + 3x - 2\} \approx -4.04829$ at $x \approx -1.15831$

Below the text results is a plot of the function. The plot shows a blue curve on a coordinate plane. The x-axis ranges from -3 to 4, and the y-axis ranges from -4 to 4. The curve has a local minimum at approximately $x = -1.15831$ and a local maximum at approximately $x = 2.15831$. The plot is labeled "Plot:" and "(x from -3 to 3.9)".

At the bottom of the page, there is a "Download page" link and the text "POWERED BY THE WOLFRAM LANGUAGE".