Math 1210: Calculus I
Graphing functions with calculus

Department of Mathematics, University of Utah

Spring 2025

Accompanying text: Varberg, Purcell, and Rigdon 2007, Section 3.5

Plotting functions

When plotting a function $y = f(x)$, there are some tools we had before considering calculus:

- Determine domain and range for f
- Investigate symmetry (odd/even functions)
- Determine intercepts
- Plot a few points
- (Maybe) Determine asymptotes

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With calculus, we have several more tools:

- Determine asymptotes
- Monotonicity: identify critical points, assess where f is increasing/decreasing
- Local maxima/minima: first/second derivative test analysis of critical points
- Concavity: analyze second derivative, find points of inflection

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The above is essentially a(n algorithmic) laundry list of things to consider when plotting a function.

Example (Example 3.5.1)

Sketch the graph of $f(x) = \frac{3x^5 - 20x^3}{32}$.

Example (Problem 3.5.1)

Sketch the graph of $f(x) = x^3 - 3x + 5$.

Example (Problem 3.5.13)

Sketch the graph of $f(x) = \frac{x}{x-1}$.

Example (Example 3.5.4)

Sketch the graphs of $f(x) = x^{1/3}$ and $g(x) = x^{2/3}$.

References I

 Varberg, D.E., E.J. Purcell, and S.E. Rigdon (2007). *Calculus*. 9th. Pearson Prentice Hall. ISBN: 978-0-13-142924-6.