

MATH 133 – Calculus with Fundamentals 1
Practice on Functions, Graphs, Shifting and Scaling
September 4, 2017

Background

Recall from the video “lecture” for last Friday that a *function* f from a *domain* D to a set Y is a rule that assigns to each element x in D , a unique element $f(x)$ in Y . This means that the graph of f passes the “vertical line test:” for each x in D , there is exactly one point $(x, f(x))$ on the graph of f . The set of values $f(x)$ for x in D is called the *range* of the function. The range is a subset of Y (it can be all of Y but it does not have to be). (Almost) all of the functions we will see have subsets of the real numbers as their domains and ranges.

Questions

- 1) The question refers to the plot of temperature versus time over a 24-hour period at a particular location that we saw Friday (see back of this page). Is this the graph of a function? If so, what are the domain and range, as intervals? If not, why does it fail to be a function?
- 3) If no domain is specified, for a function defined by a formula, then the “rule of thumb” is to take the domain to be the set of all real x such that the formula gives a well-defined value. Using this,
 - (a) What is the domain of the function defined by $f(x) = \frac{1}{x^2-4}$?
 - (b) What is the domain of the function defined by $f(x) = \sqrt{4+x}$?
- 4) All parts of this question deal with $f(x) = x^3$.
 - (a) Sketch the graph $y = f(x)$ on the domain $[-2, 2]$
 - (b) Sketch the graph $y = f(x) - 3$ on the same domain as in part (a).
 - (c) Sketch the graph $y = f(x + 1)$ on the domain $[-3, 1]$ using your graph in part (a)
 - (d) Sketch the graph $y = 2f(x)$ on the domain $[-2, 2]$.
 - (e) Sketch the graph $y = f(2x)$ on the domain $[-1, 1]$. How is this graph related to $y = f(x)$?
 - (f) Sketch the graph $y = f\left(\frac{x}{2}\right)$ on the domain $[-4, 4]$. How is this graph related to $y = f(x)$?
 - (g) (Practice on finding patterns) From section 1.1 of the text and videos, we know $y = cf(x)$ is a vertical stretching or compression of $y = f(x)$. What is the corresponding description of the graph $y = f(cx)$? How does this depend on the size of c ? (Hint: Try drawing the graphs $y = f(x) = x^3$ on $[-2, 2]$ and the graphs from part (e) and part (f) with those given domains, together on one set of axes. Note that you’ll need to take x in the interval $[-4, 4]$ to get all of them to “fit” but draw the graphs exactly as you did before, i.e. on the domains as stated before.)

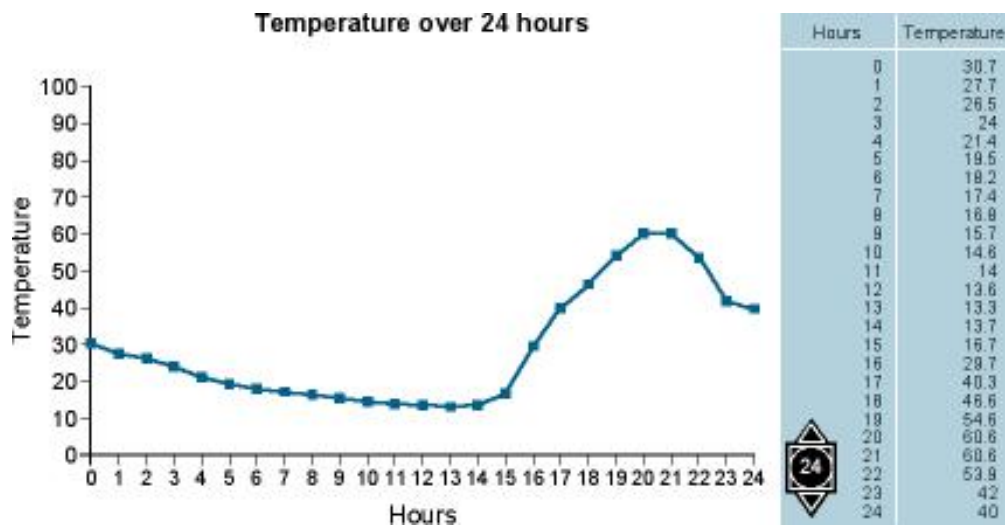


Figure 1: Figure for Question 1