Problem 1. *Graph the following:*

  1. $\cos(\theta + 2) - 1$

  2. $\sqrt{1 - x^2}$

  3. $|(x + 1)^3 - 1|$

The *Heaviside function* is defined as

$$H(t) = \begin{cases} 0 & \text{if } t \leq 0 \\ 1 & \text{if } t > 0. \end{cases}$$

Although it looks simple, it's very useful in solving differential equations. Use it for the following problem. For each part, write as little as possible (reuse old functions), and graph each function you define.

Problem 2. *Suppose you decide to drive to Chicago, so you leave at 1pm and drive at exactly the 65mph. Note: according to Google, it's 139.5 miles to Chicago.*

  1. At t o'clock (pm), how far have you driven?

  2. Suppose your car gets 30 miles/gallon, and you start with 17 gallons of gas. How much gas do you have left at t o'clock (pm)?

3. *At 2pm you get hungry and take a 30-minute lunch break, then keep driving. How far have you driven at t o'clock (pm)? How much gas do you have left?*

Problem 3. *If you invest x dollars at 4% interest compounded annually,*

1. *How many dollars will you have after one year? Write this as a function $A(x)$.*

2. *Find $B = A \circ A \circ A \circ A$.*

3. *Interpret B in a useful way.*

Problem 4. *Is the composition of two linear functions linear? If not, provide an example. If so, write the slope of the composition using the slopes of the original functions.*