Problem 1. Give a practical interpretation in words of the following functions:

(a) $k(g(t))$, where $L = k(H)$ is the length of a steel bar at temperature $H$ and $H = g(t)$ is the temperature at time $t$

\[ k(g(t)) \text{ is the length of the steel bar at time } t. \]

(b) $t(f(H))$, where $t(v)$ is the time of a trip at velocity $v$, and $v = f(H)$ is the velocity at temperature $H$.

The time of the trip at temperature $H$

Problem 2. Using your own words, briefly explain the process of decomposition of functions.

Sometimes we reason backwards to find the functions which went onto a composition. This process is called decomposition.

Problem 3. Using your knowledge of the absolute value function, explain in a few sentences the relationship between the graph of $y = |\sin(x)|$ and the graph of $y = \sin(x)$.

The graphs coincide when $\sin(x) \geq 0$, i.e., on the intervals

\[ [0, \pi], [2\pi, 3\pi], [4\pi, 5\pi], \ldots \]

\[ [-2\pi, -\pi], [-4\pi, -3\pi], [-6\pi, -5\pi], \ldots \]

and the graph is reflected around the $x$-axis outside the above intervals. The graphs of $|\sin(x)|$ is always non-negative.
Problem 4. Use a graph to decide whether or not the following functions are invertible.

(a) \[ y = x^6 + 2x^2 - 10 \]

No

(b) \[ y = |x| \]

No

(c) \[ y = e^{x^2} \]

No. This function is even.

Problem 5. The figure below defines a function \( f \). Rank the following quantities in order from least to greatest: 0, \( f(0) \), \( f^{-1}(0) \), \( f(3) \), \( f^{-1}(3) \).

Based on the graphs, the approximate values are

\[ f(0) \approx 1.5, \quad f^{-1}(0) \approx 2.5, \quad f(3) \approx -1, \quad f^{-1}(3) \approx -5, \]

and so the order is

\[ f^{-1}(3), f(3), 0, f(0), f^{-1}(0) \]

Problem 6 Briefly explain what a combination of functions is.

A combination of functions is when you add, subtract, multiply or divide two or more functions.