MAT137 - Calculus with proofs

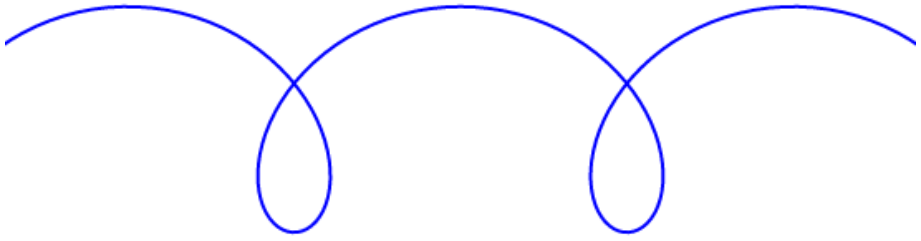
- Assignment #3 due on November 5
- Assignment #4 due on November 26

- TODAY: Functions and inverse functions

- **Watch videos 4.3, 4.3 by Wednesday**

Worm up

A worm is crawling across a table. The path of the worm looks something like this:



True or False?

The position of the worm is a function.

Worm function

A worm is crawling across a table.
For any time t, let $f(t)$ be the position of the worm.
This defines a function f.

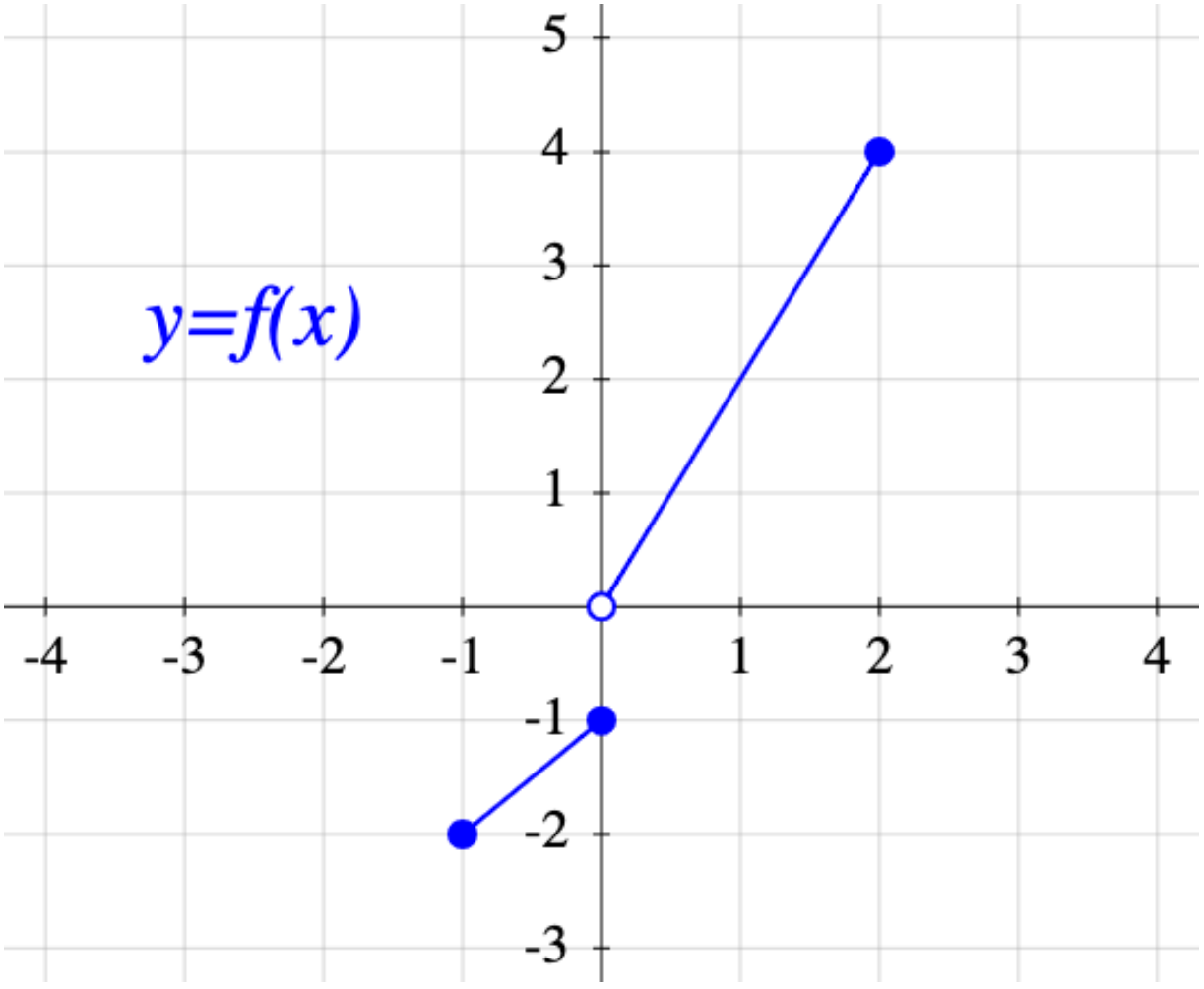
1. What is the domain of f?
2. What is the codomain of f?
3. What is the range of f?

Function, number, or nonsense?

Let f, g be functions. Let x be a number.
Classify as (A) function, (B) number, or (C) nonsense:

1. $f(x)$
2. $f \circ g$
3. $f \circ (g(x))$
4. $(f \circ g)(x)$
5. $f(x) \circ g(x)$
6. $f(x)g(x)$
7. $f(g(x))$
8. $f(g)$
9. $f(g)(x)$
10. $f(g(x)f(x))$
11. e^x
12. $\ln x$
13. $\ln$
14. $\sin \circ e^x$
15. $\sin \circ \ln$
16. $(\ln \circ \sin)(e^x)$
17. $e^x \circ \sin$
18. $\sin^2$

Inverse function from a graph



Calculate:

1. $f(2)$
2. $f(0)$
3. $f^{-1}(2)$
4. $f^{-1}(0)$
5. $f^{-1}(-1)$
6. $f^{-1}(-0.5)$

Absolute value and inverses

Let $h(x) = x|x| + 1$

1. Calculate $h^{-1}(-8)$.
2. Find an equation for h^{-1}.
3. Sketch the graph of h.
4. Sketch the graph of h^{-1}.
5. Verify that
   - for every $t \in \boxed{???}$, $\quad h(h^{-1}(t)) = t$.
   - for every $t \in \boxed{???}$, $\quad h^{-1}(h(t)) = t$.