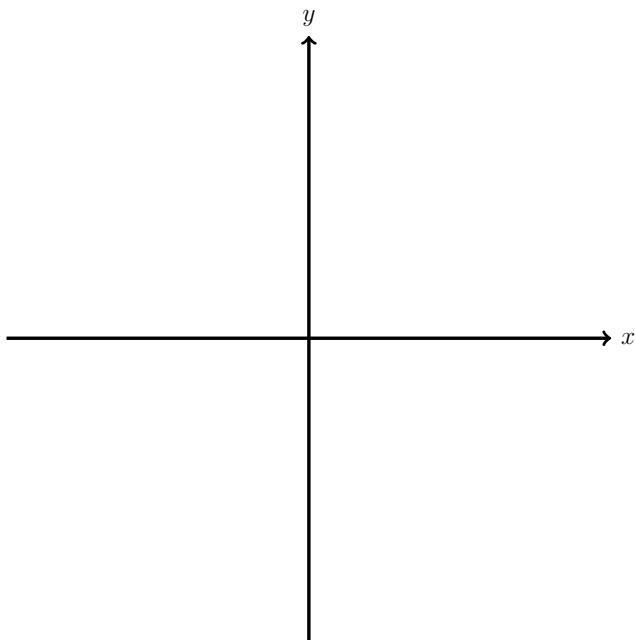
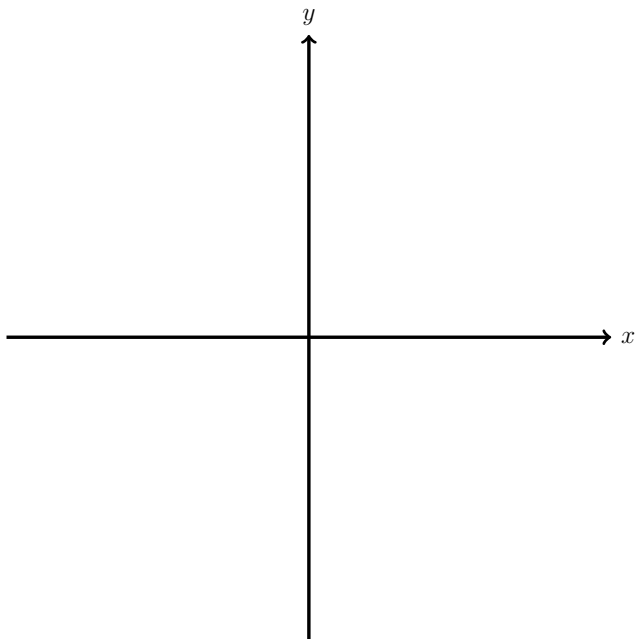


Try to graph these functions by hand. Think about where the values are defined (the domain), where the values are positive or negative, and whether the values are large or small in absolute value.

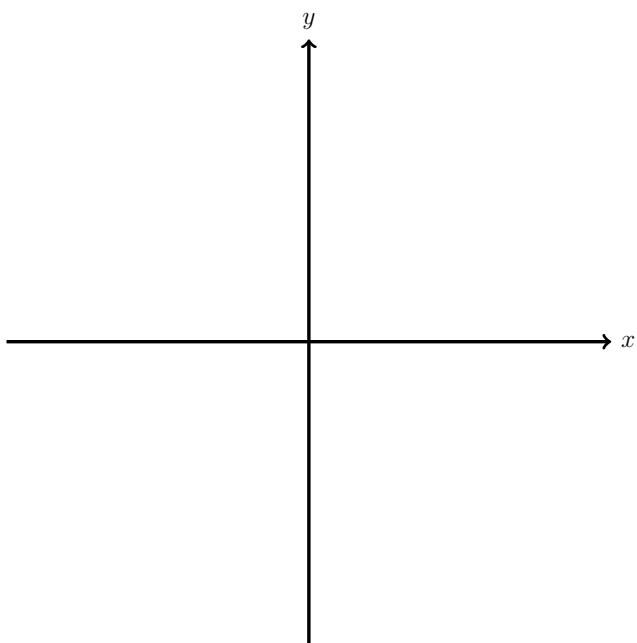
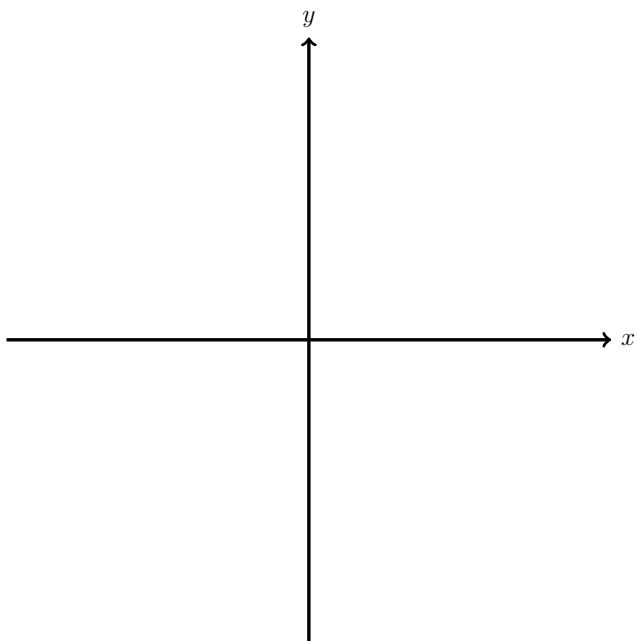
1. Graph the function $f(x) = \frac{|x-2|}{x-2}$, and find $\lim_{x \rightarrow 2^-} f(x)$



2. Graph the function $g(x) = \frac{1}{x^2 - 4}$. Where is this function defined? Is this function continuous?



3. Graph the functions $h(x) = \frac{|x-2|}{x^2-4}$ and $k(x) = \frac{1}{x+2}$. Where are these functions defined? How do they compare?

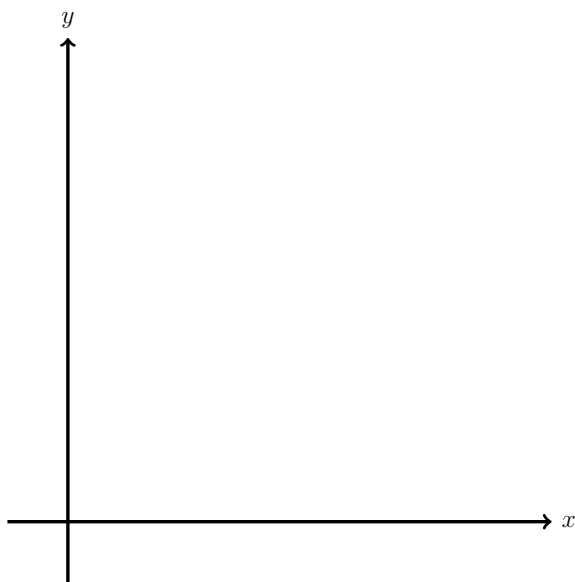


4. Here is a table of the US tax rate for single filers (in 2023):

Tax Rate	Taxable income bracket	Tax owed
10%	\$0 – \$11,000	10% of taxable income
12%	\$11,001 – \$44,725	\$1,100 plus 12% of the amount over \$11,000
22%	\$44,726 – \$95,375	\$5,147 plus 22% of the amount over \$44,725
24%	\$95,376 – \$182,100	\$16,290 plus 24% of the amount over \$95,375
32%	\$182,101 – \$231,250	\$37,104 plus 32% of the amount over \$182,100
35%	\$231,251 – \$578,125	\$52,832 plus 35% of the amount over \$231,250
37%	\$578,126 –	\$174,238.25 plus 37% of the amount over \$578,125

Let $T(d)$ be the total tax owed, as a function of d dollars of income.

- (a) What is $T(30,000)$?
- (b) What kind of function is $T(d)$? Graph $T(d)$.



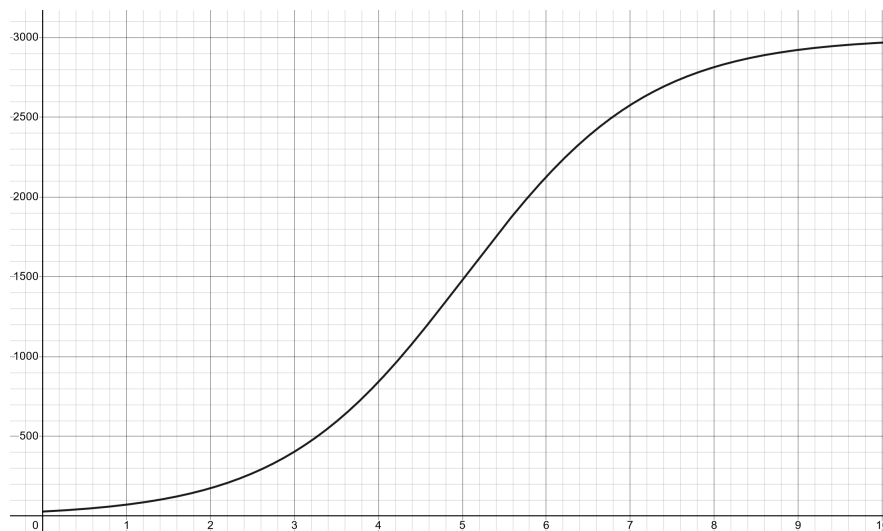
- (c) Let $R(d)$ be the tax rate for the d -th dollar of income. What does $R(d)$ represent on the graph?
- (d) How do the numbers 1100, 5147, 16290, and so on in the third column appear in the graph? What would it mean if the last column just said “ $R(d)\%$ of taxable income”?

5. A certain professor rides her bicycle to school every day. She always leaves at 8am, heading directly for campus along the same route and arriving at 8 : 30am. Usually she rides at a steady pace, never going too fast or too slow. Some days, she decides to stop by a deli to grab a bagel. She doesn't plan ahead on these days, so she then has to ride faster to make it on time. One day, she made it halfway to school before realizing she forgot something, so had to ride back and get it. That day, she arrived at school fifteen minutes later than usual.

Draw three graphs, of distance from her house as a function of time, to represent these different kinds of trips.



6. The registrar at a certain college is trying to see how students register for courses. Below is the graph of a function $N(t)$, the total number of students who have registered by t hours after noon, when registration opens.



- (a) Estimate $N^{-1}(2000)$. What does this number mean?
- (b) Estimate $N'(2)$ (pay attention to the scales!). What does this number mean?
- (c) Sketch a graph of $N'(t)$.

