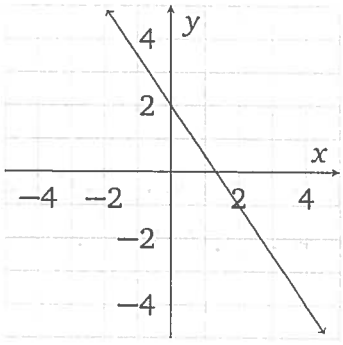
Reading the Graph of a Function

In these exercises, we will practice reading a graph of a function, and translating into verbal, tabular, and, and formulaic representations.

1. Here is the graph of a function G.



a) Find $G(0)$

$G(0) = 2$

b) Find $G(-2)$

$G(-2) = 5$

c) Find $G(4)$

$G(4) = -4$

d) If $G(x) = -1$, then what was x?

$x = 2$

e) Basic Algebra Review: what is the equation of this line in slope-intercept form?

slope is $\frac{-3}{2}$; y-intercept is 2;

so: $y = \frac{-3}{2}x + 2$

f) Give a *formula* for G. This is subtly different from the previous question.

$G(x) = \frac{-3}{2}x + 2$

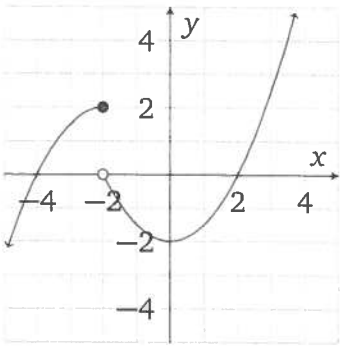
g) Give a *table* for G.

x	$G(x)$
-2	5
0	2
2	-1
4	-4

h) Give a *verbal* representation of G. Use action words to say what G does to its input.

G multiplies input by $-3/2$, then adds 2

2. Here is the graph of a function P.



a) Find $P(0)$

$P(0) = -2$

b) Find $P(2)$

$P(2) = 0$

c) Find $P(-2)$

$P(-2) = 2$

d) Solve $P(x) = 1$

$x \approx -3.5$ or $x \approx 2.5$

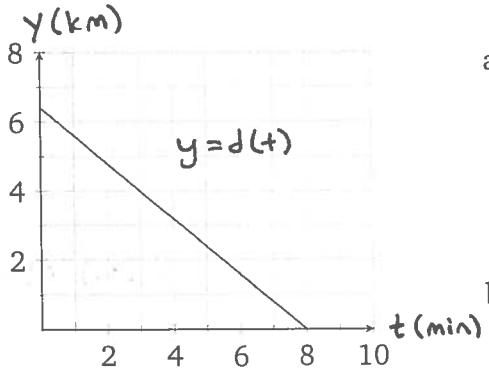
e) Solve $P(x) = 0$

$x = -4$ or $x = 2$

f) Solve $P(x) = -1$

$x \approx -4.5, -1.5,$ or 1.5

3. Jonah is biking home from a trip to the grocery store. At time t (in minutes since leaving), $d(t)$ is the remaining distance (in km) to home.



a) Label the axes of this graph with variables appropriately. If there is context to the problem, the label should also communicate the units of measurement.

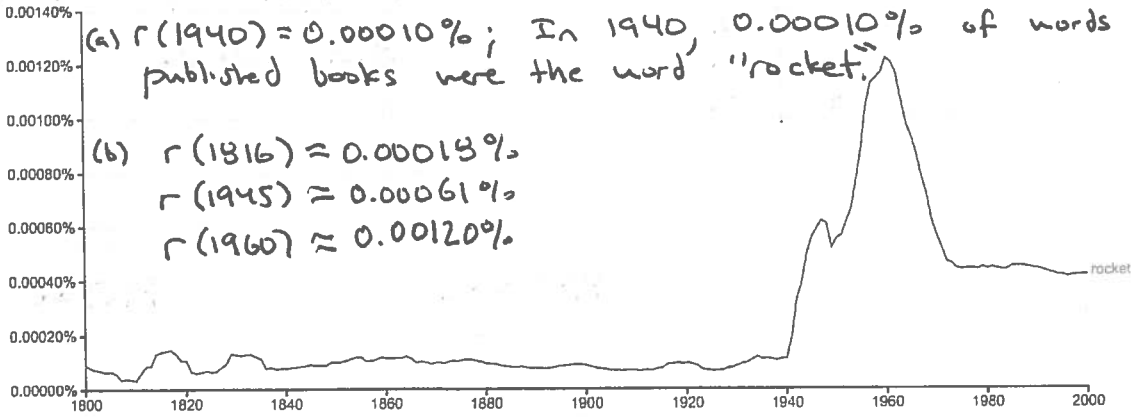
b) Find $d(8)$. Write a complete sentence explaining what the numbers (both 8 and your result for $d(8)$) mean.
$d(8) = 0$. After 8 min, Jonah is home (0 km from home).

c) How far away from Jonah's home is the grocery store?
about 6.4 km, since that is what $d(0)$ is.

d) Solve $d(t) = 3$. Write a complete sentence explaining what the numbers mean.
$d(t) = 3 \Rightarrow t \approx 4.25$
When is Jonah 3 km from home? 4.25 min after he left.

e) What was Jonah's speed biking home?
He travels 6.4 km in 8 min, so
$\frac{6.4 \text{ km}}{8 \text{ min}} = 0.8 \frac{\text{km}}{\text{min}}$

4. Google ngram provides data on the frequency of word-use in published books. So, out of all words printed in book in a given year, what percentage were a particular word. Let r be the function that outputs the frequency of the word 'rocket' in year t. Here is the graph of r.



(a) $r(1940) = 0.00010\%$; In 1940, 0.00010% of words in published books were the word "rocket."

(b) $r(1816) \approx 0.00013\%$
$r(1945) \approx 0.00061\%$
$r(1960) \approx 0.00120\%$

(a) What is $r(1940)$? Write a complete sentence explaining what the numbers mean.

(b) There are three or four peaks in this chart. Express the input-output information at the peaks using function notation. For example, by writing something like $r(1) = 2$.

(c) Do you have knowledge of history that could explain each of the peaks?
printing of Star-Spangled Banner; World War II; U.S.A/U.S.S.R space race