4. [7 points] On a warm fall day, Schinella decides to walk home from work. Let $d = f(t)$ be the function giving Schinella's distance **from work**, in miles, t minutes after she leaves work.

a. [3 points] Her walk home from work is 3 miles. Schinella wants to write a new function $g(h)$ that gives her distance **from home**, in miles, h **hours** after she leaves work. Write a formula for $g(h)$ in terms of f.

$g(h) =$ ____________________

b. [2 points] Schinella (who is from Canada) wants to write another new function $k(t)$ that gives her distance from work in **kilometers** t minutes after she leaves work. Given that 1 mile is about 1.6 kilometers, circle the correct formula for $k(t)$ below.

$1.6f(t)$ $\qquad f(1.6t)$ $\qquad \dfrac{1}{1.6}f(t)$ $\qquad f\left(\dfrac{t}{1.6}\right)$

c. [2 points] Let $c(t)$ be the function that gives the number of episodes of the podcast *Canadaland* that Schinella has listened to in the first t minutes of her walk. Assume that both $c(t)$ and $f(t)$ are invertible. Using those functions or their inverses, write an expression for Schinella's distance from work, in miles, after she's listened to 2.5 episodes of *Canadaland* while walking home.

____________________ miles

5. [13 points]

a. [4 points] A zookeeper has determined that the function $w(t)$ below provides a good model of the weight, in ounces, of a certain kind of snake t years after it hatches.

$$w(t) = -2e^{-(t-16)/5} + 52$$

Find the value of each of the following **as numbers rounded to two decimal places**. Then **briefly interpret** what each quantity means in the context of the problem.

i. $w(0) =$ ____________ **Meaning:**

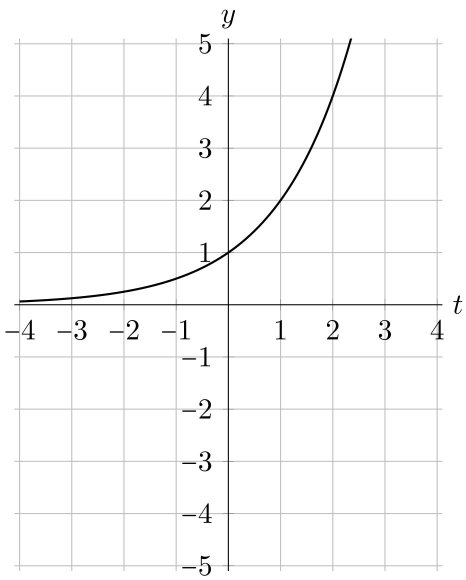
ii. $\lim_{t\to\infty} w(t) =$ ____________ **Meaning:**

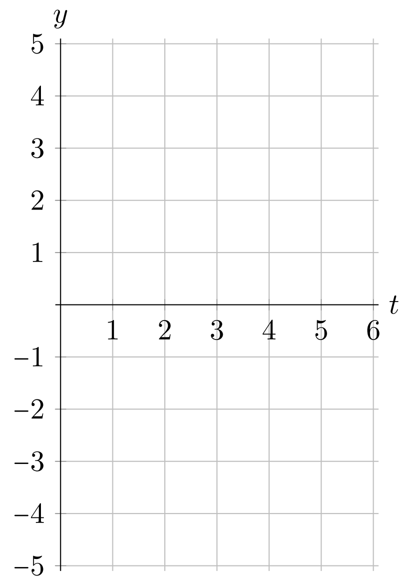
(Problem continues on the next page.)

b. [2 points] The zookeeper also has a model $\ell(t)$ of the length, in feet, of this type of snake t years after it hatches.

$$\ell(t) = -2^{-(t-2)} + 5$$

Using the graph of $y = 2^t$ below as a starting point, sketch a graph of $y = \ell(t)$, for $0 \le t < 6$, on the axes provided to the right.





c. [5 points] List the transformations you need to apply to the graph of $y = 2^t$ to transform it to that of $y = \ell(t)$. Fill in the first blank with one of the phrases below. Fill in the second blank with a number, "by a factor of" and a number, or N/A for reflections.

Shift it to the left — Stretch it horizontally — Reflect it across the y-axis

Shift it to the right — Compress it horizontally — Reflect it across the t-axis

Shift it up — Shift it down — Stretch it vertically — Compress it vertically

First, ______________________________ by ____________

then, ______________________________ by ____________

then, ______________________________ by ____________

then, ______________________________ by ____________

d. [2 points] Give equations for all vertical and horizontal asymptotes of $\ell(t)$. If there are none, write NONE.

Vertical Asymptotes: ____________________

Horizontal Asymptotes: ____________________