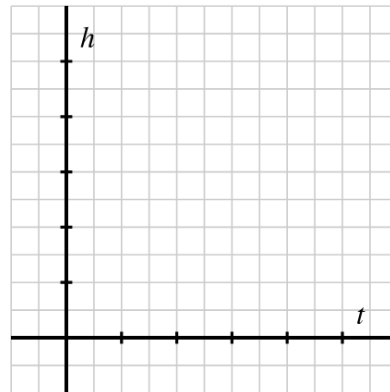
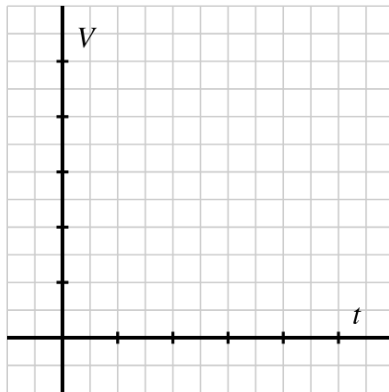


No calculators or notes allowed. Please show all your work (an answer with no justification will may not get credit).

1. Consider a tank in the shape of a sphere where the tank's radius is 2 meters, and recall that the volume of a sphere is  $V = (4/3)\pi r^3$ . Further, the tank is initially completely full, and it is being drained at a constant rate of 1.5 cubic meters per minute.
  - (a) How much water is in the tank at  $t = 0$ ? (Write down the expression you would evaluate on your calculator- You can leave your answer unsimplified).
  - (b) If  $h(t)$  is the height of the water at time  $t$ , what is the height when  $t = 0$ ?
  - (c) Below sketch appropriate curves for the volume  $V(t)$  and the height of water,  $h(t)$ .



2. Chicago's average monthly rainfall  $R = f(t)$  (inches) is given as a function of  $t$  (month, where January = 1) in the table below:

$t$ month	1	2	3	4	5	6	7	8
$R$ inches	2	2	3	3	5	4	5	3

- (a) Solve  $f(t) = 4$  for  $t$ :
- (b) Solve  $f(t) = f(3)$  for  $t$ :
- (c) Calculate  $AV_{[4,7]}$ .
- (d) Can we express  $t$  as a function of  $R$ ? (Explain)

3. (a) Find an equation of the line through  $(-1, 7)$  with slope  $-1/2$ .

(b) Does the data given by the following table lie on a line? If so, find the equation of the line:

$x$	1	3	4	7
$y$	7	3	1	-5

4. Below, sketch the graph of a function  $f(x)$  on  $[0, 4]$  such that  $f(1) = 3$  and  $AV_{[1,3]} = 2$ .

