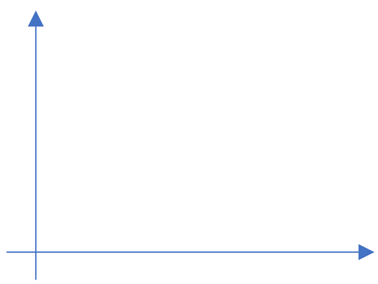
Fast and Curious   Name:____________________________

Bal, Malik, and Jayda like to be on the road. One day, they decide to experiment with how fast their vehicles can go. After recording some data, they begin to wonder: how is their distance traveled related to the velocity over the trip?

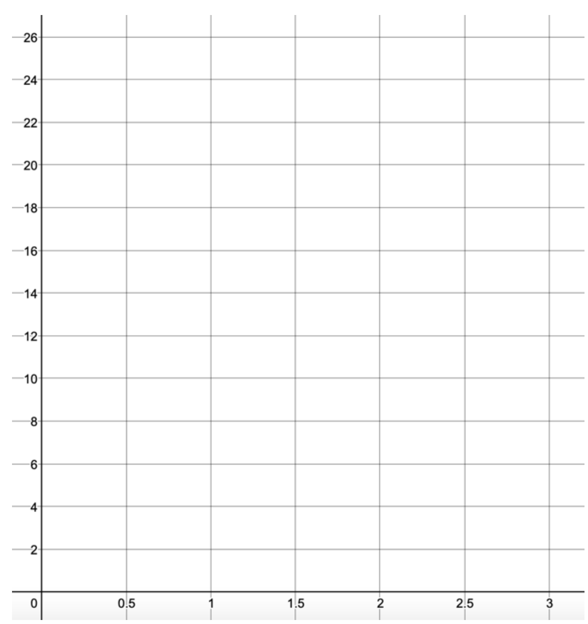
1. On a certain stretch of highway, Bal puts on Cruise Control and drives at 70 miles per hour for 1 and a half hours.
    a. Sketch a graph of Bal's velocity on this stretch of highway.



    b. How much distance did she cover during that time period?

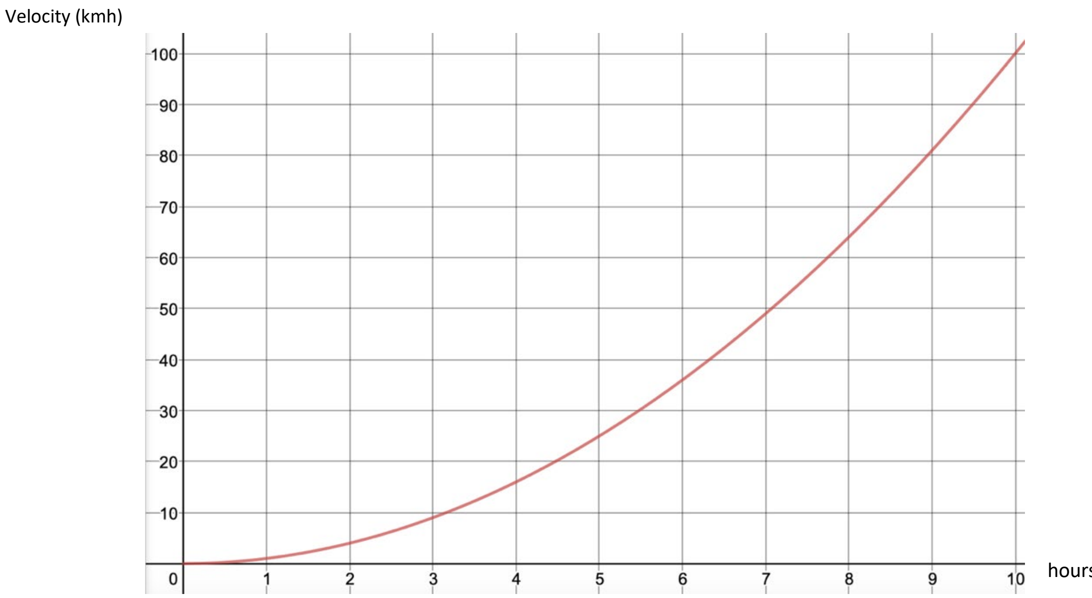
2. Bal's little brother Malik is riding his bicycle with a velocity given by $v(t) = 5 + 6t$ for $0 \leq t \leq 3$ where $v(t)$ is in miles per hour and t is in hours.

    a. Sketch a graph of Malik's velocity on the coordinate grid provided.



    b. How much distance did Malik cover over the three-hour time period?

3. Jayda is riding her motorcycle with a velocity given by $v(t) = t^2$ km per hour for $0 \le t \le 10$. The graph of her velocity is shown below.



a. How can we use this graph to determine how far Jayda has traveled?

b. During which 1-hour interval is Jayda accumulating the most kilometers? How do you know?

4. Not all areas can be found using simple geometric formulas, so we'll have to approximate the area. To keep things simple, we'll use 10 rectangles of equal width.
   a. How will you determine the height of each rectangle?

   b. Record the height, width, and area of each rectangle in the table below. Use colored pencils to draw these rectangles in the graph above.

   c. What is your best guess for the distance Jayda rode during those 10 hours?

   d. Is your answer in part c) an overestimate or an underestimate? How do you know?

Width	Height	Area

5. How could we get an even better approximation of Jayda's total distance traveled?

Section 5.1 —Approximating Areas with Riemann Sums

Important Ideas:

Check Your Understanding!

1. Consider the region enclosed between the x-axis and the curve $y = e^x$.
   a. Use a left Riemann sum approximation with 5 equal subintervals to approximate the area of the region between $x = -1$ and $x = 4$. Show your work.

   b. Use a midpoint Riemann sum approximation with 5 equal subintervals to approximate the same region. Show your work.

2. The rate at which water flows out of a pipe in gallons per hour is given by $R(t)$. Selected values of $R(t)$ are shown in the table below.
   a. Use a right Riemann sum approximation with 4 equal subintervals to approximate the area underneath $R(t)$ from $t = 0$ to $t = 24$.

   b. What does this area represent?

t (hours)	$R(t)$ (gallons per hour)
0	9.6
3	10.4
6	10.8
9	11.2
12	11.4
15	11.3
18	10.7
21	10.2
24	9.6