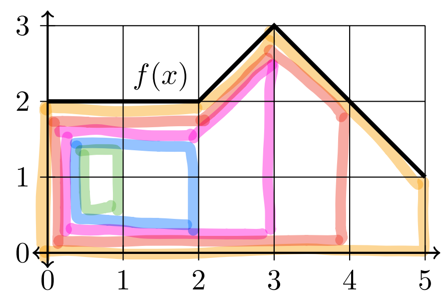
"Area So Far" functions

1. Let $f(x)$ be given by the graph below and define $A(x) = \int_0^x f(t)dt$.



Compute the following using the graph. Hint: $A(1) = \int_0^1 f(x)\,dx$, which calculates the area accumulated under the graph from $x = 0$ to $x = 1$.

$A(1) =$ 2 $\qquad f(1) =$ 2

$A(2) =$ 4 $\qquad f(2) =$ 2

$A(3) =$ 6.5 $\qquad f(3) =$ 3

$A(4) =$ 9 $\qquad f(4) =$ 2

$A(5) =$ 10.5 $\qquad f(5) =$ 1

The x-value in the interval $[0, 5]$ at which $A(x)$ attains its maximum is 5

The maximum value of $A(x)$ on $[0, 5]$ is 10.5

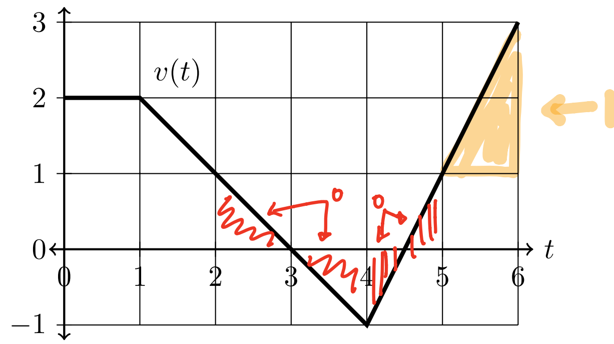
The x-value in the interval $[0, 5]$ at which $f(x)$ attains its maximum is 3

The maximum value of $f(x)$ on $[0, 5]$ is 3

What can you say about the **rate of change** of $A(x)$?

it is always positive

2. A toy car is travelling on a straight track. Its velocity $v(t)$, in meters per second, is given by the graph below. Define $s(t)$ to be the position of the car in meters, and suppose that $s(0) = 0$. Note that $s(t) = \int_0^t v(x)\,dx$. (Here, x is called the "dummy variable of integration".)



Compute the following:

$s(2) =$ 3.5 $\quad s(4) =$ 3.5 $\quad s(6) =$ 5.5

$v(2) =$ 1 $\quad v(4) =$ −1 $\quad v(6) =$ 3

The t-value in the interval $[0, 6]$ at which $s(t)$ attains its maximum is 6

The maximum value of $s(t)$ on $[0, 6]$ is 5.5

The t-value in the interval $[0, 6]$ at which $s(t)$ attains its minimum is 4.5

The minimum value of $s(t)$ on $[0, 6]$ is 3.5

The t-value in the interval $[0, 6]$ at which $v(t)$ attains its maximum is 6

The maximum value of $v(t)$ on $[0, 6]$ is 3

The t-value in the interval $[0, 6]$ at which $v(t)$ attains its minimum is 4

The minimum value of $v(t)$ on $[0, 6]$ is −1

Describe the position of the car over the 6 seconds. Moves forward for 3 seconds, then moves backwards for 1.5 seconds but does not get back where it started, then moves forward for the remainder of the time

Describe the velocity of the car over the 6 seconds. positive for 3 seconds but slowing down, then negative for 1.5 seconds, then is positive for the remaining ti