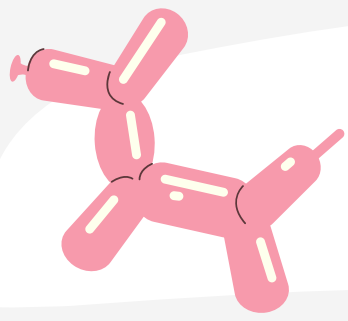
BALLOON INFLATION



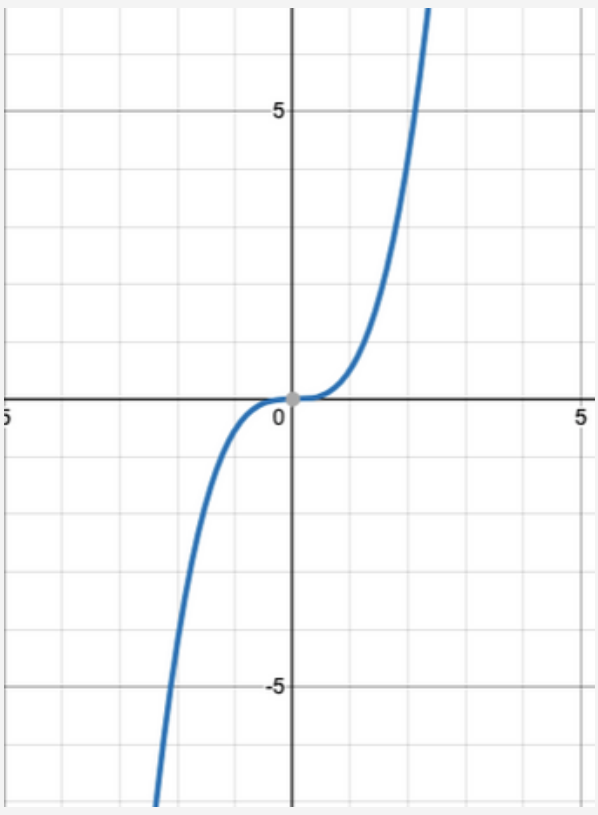
Background information:

You are inflating a balloon with helium gas. As you inflate it, the radius of the balloon increases
at a constant rate of 0.5 inches per minute.

Equations used through:

The volume of the balloon as a function of its radius:
$V(r) = 4/3\pi\ (r)^3$
The radius of the balloon as a function of time:
$r(t) = 0.5(t)$

Problem:



1. Calculate the radius and determine the volume of the balloon after 5 minutes and 7 minutes.
2. Determine a function that represents the volume of the balloon as a function of time: $V(t)$

To finding the radius after 5 and 7 minutes:

- 5 minutes: $r(t) = 0.5\ in(5\ min) = 2.5$ inches
- 7 minutes: $r(t) = 0.5\ in\ (7\ min) = 3.5$ inches

To determine the volume after 5 and 7 minutes:

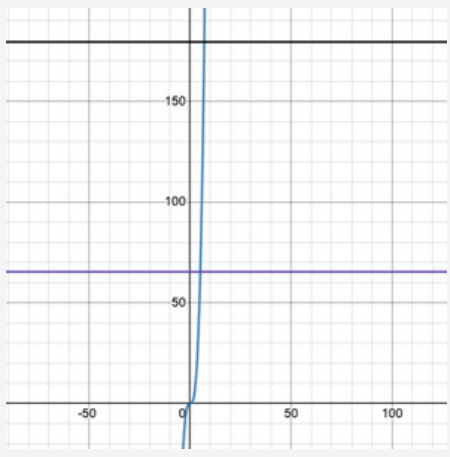
- 5 minutes: $v(5) = 4/3\pi\ (2.5)^3 = 65.44\ in^3$
- 7 minutes: $v(7) = 4/3\pi\ (3.5)^3 = 179.59\ in^3$

Function, $V(t)$:

- $V(t) = 4/3\pi\ (0.5(t))^3$

Using the function to calculate the volume of the balloon after 5 minutes and 7 minutes

- 5 minutes: $V(5) = 4/3\pi\ (0.5(5))^3$
- 7 minutes: $V(7) = 4/3\pi\ (0.5(7))^3$



Average rate of change

Compute the average rate of change of the volume of the balloon from 5 minutes to 7 minutes:

$= V/T = (V(7) - V(5)) / (7-5)$

Compute the average rate of change of the volume of the balloon from 10 minutes to 12 minutes:

$= V/T = (V(12) - V(10)) / (12-10)$

Analyze the average rate of change of the volume of the balloon as time passes.

As time passes, the average rate of change of the volume will increase because the radius is continuously increasing at a certain rate. For every minute it passes, the balloon inflates faster.

Our additional aplication:

Calculate the radius and determine the volume of the balloon after 15 minutes and 20 minutes.

To finding the radius after 15 and 20 minutes:

- 15 minutes: $r(t) = 0.5\ in(15\ min) = 7.5$ inches
- 20 minutes: $r(t) = 0.5\ in\ (20\ min) = 10$ inches

To determine the volume after 15 and 20 minutes:

- 15 minutes: $v(15) = 4/3\pi\ (7.5)^3 = 1767.14\ in^3$
- 20 minutes: $v(20) = 4/3\pi\ (10)^3 = 4188.79\ in^3$

If you have doubts about the topic:

How to measure the radius of a balloon?

How to measure the volume of a balloon?

How to measure the rate of change of a balloon?

How to do a Volume vs Time graph?