

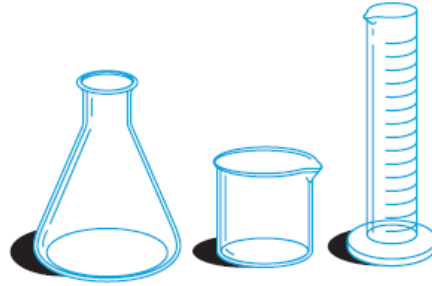
Using Rates of Change to Create a Graphical Model (2.4)

Math Learning Target:



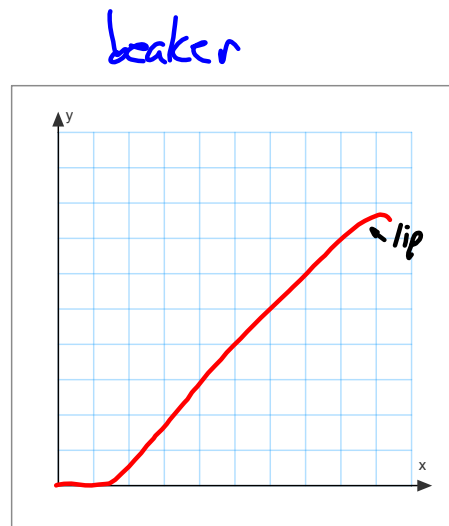
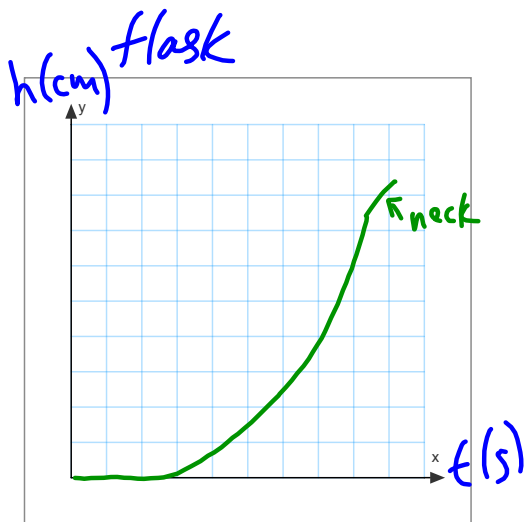
"I can represent written and verbal descriptions of rates of change using graphs."

Ex.1

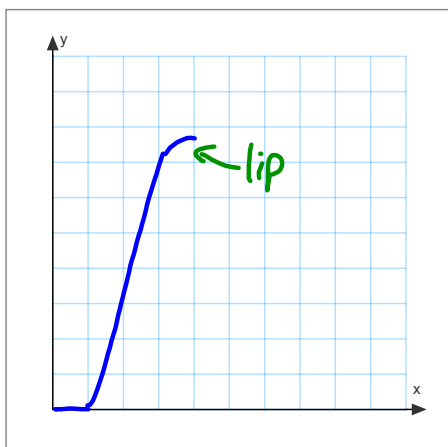


A flask, a beaker, and a graduated cylinder are being filled with water. The rate at which the water flows from a hose is the same when filling all three containers. Draw possible water level versus time sketches for the three containers.

Assume the time interval begins the moment the water begins to pour from the hose, and the hose stays immediately above the current water level at all times.



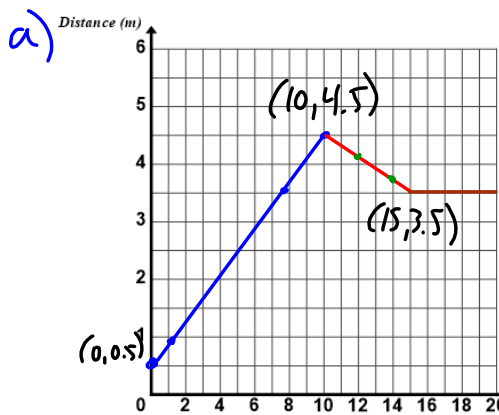
graduated cylinder



Ex.2

Adam and his friend are testing a motion sensor. Adam stands 0.5 m in front of the sensor and then walks 4 m away from it at a constant rate for 10 s. Next, Adam walks 1 m toward the sensor for 5 s and then waits there for another 5 s.

- a) Draw a distance versus time graph for Adam's motion sensor walk.
- b) What is the average rate of change in his distance in the first 10 s?
- c) What are the instantaneous rates of change at $t = 1$ s and $t = 7$ s?
- d) What is the average rate of change in the next 5 s?
- e) What are the instantaneous rates of change at $t = 12$ s and $t = 14$ s?
- f) What is the instantaneous rate of change at $t = 18$ s?
- g) Draw a speed versus time graph for Adam's motion sensor walk.



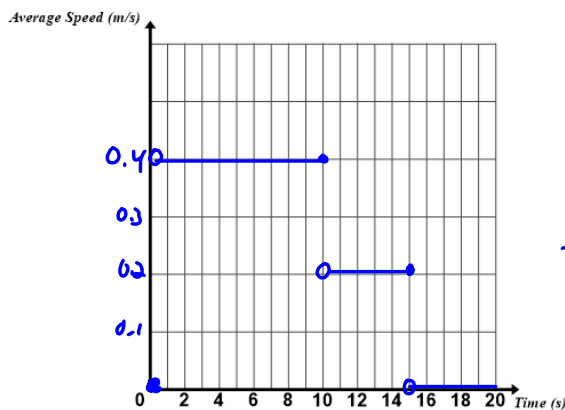
b) $aroc = m_{secant}$
 $= \frac{\Delta d}{\Delta t}$
 $= \frac{4.5 - 0.5}{10 - 0}$
 $= \frac{4}{10}$
 $= 0.4$
 $\therefore 0.4 \text{ m/s}$

c) $iroc = m_{tangent}$ (at $t=1$ and $t=7$)
 $= 0.4 \text{ m/s}$

e) $iroc$ (at $t=12, t=14$)
 $= m_{tangent}$
 $= -0.2$
 \therefore relation is linear between 10 and 15.

d) $aroc = m_{secant}$
 $= \frac{3.5 - 4.5}{15 - 10}$
 $= \frac{-1}{5}$
 $= -0.2$
 \therefore moving toward the sensor at 0.2 m/s

f) $iroc$
 $= 0$



* speed is non-negative

ENTERTAINMENT: pp.103-106 #1, 2*, 3 to 9*, 10, 11, 14
 * in #2, the answer in the back has a small error. Do you know what it is?
 Also, the answer for #9 in the back has some mistakes.