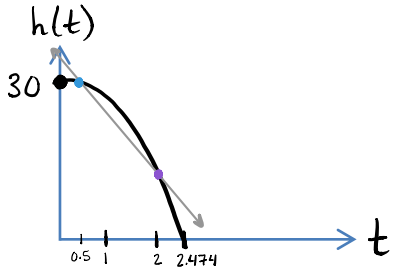
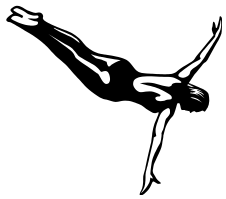
Sols

Rates of Change

The La Quebrada Cliff Divers are among the most spectacular high divers; they leap off of rocky outcroppings into ocean bays. If one of these divers jumps from a spot that is 30 meters above the water, his or her height can be modeled well by a function with the rule $h(t) = 30 - 4.9t^2$ (height in meters and time in seconds).

1) Use your graphing calculator to sketch a graph of the diver's height $h(t)$ at time $t \geq 0$. Be sure to adjust your window appropriately.





2) Determine how long it will take for the diver to reach the water (height = 0).

≈ 2.5 seconds (t-intercept)

3) Determine the number of seconds that has passed when the diver reaches the maximum height. What is the maximum height?

0 seconds, the maximum height is 30 m, the height of the cliff

3a) Determine the height of the diver after 0.5 seconds has passed.

28.78 m

b) Determine the height of the diver after 2 seconds has passed.

10.4 m

c) Create two ordered pairs based on your answers to parts a) and b). Label these two points on the graph sketched above. Draw a line connecting these two points. This is called a ***secant line***.

(0.5, 28.78), (2, 10.4)

d) Find the slope of the secant line.

$$m = \frac{28.78 - 10.4}{0.5 - 2} \approx -12.25$$

e) Determine the average speed of the diver over the time period from 0.5 seconds to 2 seconds . Remember that speed represents meters per second. In order to do this, you must find the change in height and the change in time and write it as a ratio of *m/s*.

The average rate of change over the interval [a,b] is the same as the slope of the secant line! So, the diver averaged 12.25 m/s from 0.5 to 2 sec.

4) Determine the average speed of the diver from 0 seconds to 0.75 seconds.

$$\frac{h(0.75) - h(0)}{0.75 - 0} = \frac{30 - 4.9(.75)^2 - (30 - 0)}{0.75} = -3.675$$

The diver averaged 3.675 m/s in the first 0.75 s.