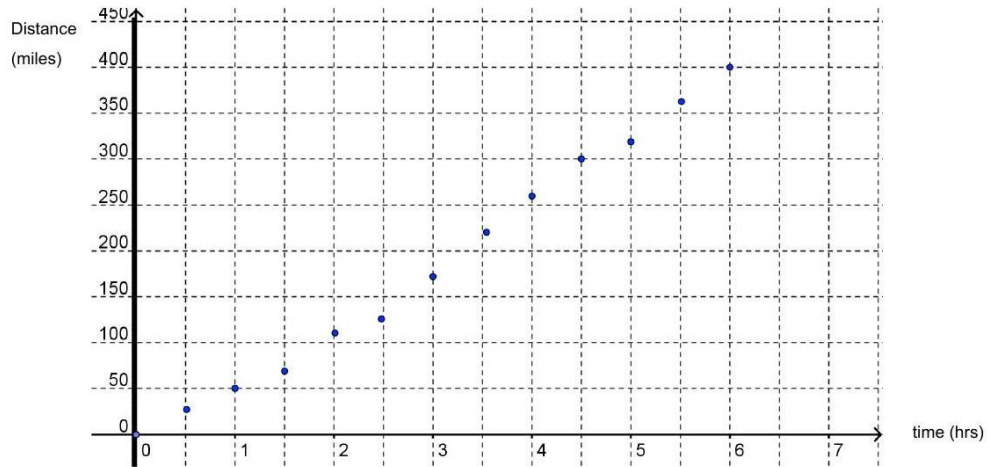


Math 1210 #8

Two Problems, One Theme

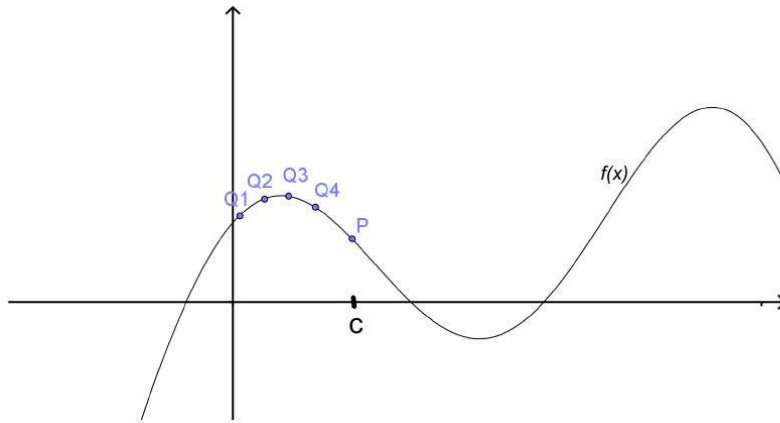
It took me 6 hours to drive 400 miles. As I drove I wrote the mileage on the trip-o-meter each half hour. Here is a graph of my trip.



t	d
3	170
2.5	130
2.1	112
2	110

What was my average velocity for the trip? $v_{av} =$
What was my average velocity for the first half of the trip?
How fast was I going at $t = 2$? $v_{inst} =$

Archimedes - slope of a tangent line.
Kepler, Galileo, Newton - Instantaneous velocity.



Q = "movable" point.
P = Point in question

secant line \Rightarrow line through P and Q .

tangent line \Rightarrow limiting position (if it exists) of secant line as Q moves closer to P along the curve.

slope of secant line

slope of tangent line

EX 1

Find the slope of $y = -x^2 + 3x$ when $x = -1, 2,$ and 5 .

EX 2

Find the equation of the tangent line to $y = \frac{2}{x}$ at $x = 1$.

Geometrically finding the slope of a tangent line to a curve is exactly the same as finding the instantaneous velocity for a moving object.

EX 3

An object travels along a line so that its position is given by $s(t) = t^2 + 1$ (measured in meters, t measured in seconds.)

3a)

What is its average velocity on the interval $2 \leq t \leq 3$?

3b)

Average velocity on $2 \leq t \leq 2.003$?

3c)

Average velocity on $2 \leq t \leq 2 + h$?

3d)

Instantaneous velocity at $t = 2$?

"Rate of change" means instantaneous rate of change.

