Closing Mon night: 10.1
Closing Wed night: 2.1
Closing Fri night: 2.2
Warning: The first two assignments will be challenging. Visit the MSC!
Check out the newsletter for hints.

Entry Task (like problem 2 of 10.1):
There are two points on the unit circle at which the tangent line also passes through the point (-3, 4).

1. Label unknown point(s): (a,b).
2. Write what you know about (a,b).
   (a) On circle.
   (b) Line tangent to circle at (a,b).
   (c) Line goes thru (-3,4) and (a,b)
3. Solve.

Finishing 10.1

Circular Motion: $x = r\cos(\theta_0 + \omega t)$

$$y = r\sin(\theta_0 + \omega t)$$

Examples:

(a) $x = 2\cos\left(\frac{\pi}{4}t\right), y = 2\sin\left(\frac{\pi}{4}t\right)$

(b) $x = 3\cos\left(-\frac{\pi}{2}t\right), y = 3\sin\left(-\frac{\pi}{2}t\right)$

(c) $x = 7\cos\left(\frac{\pi}{6} + \frac{\pi}{2}t\right)$,

$y = 7\sin\left(\frac{\pi}{6} + \frac{\pi}{2}t\right)$

Identify θ_0, r, and ω.

Plug in t = 0 sec and t = 1 sec.

What do these constants represent?

Summary:

θ_0 = the starting angle (radians)

w = angular speed (rad/time)

t = time

Example:

A bug follows a circular path with radius 8 inches.

It starts at the west-most edge.

It rotates counterclockwise at a constant 10 revolutions per minute.

Give the equations for motion in terms of time *t*.

r = ??

θ_0 = ?? (give in radians)

w = ?? (give in radians/min)

Ch. 2 Limits and Derivatives

2.1 Motivation

Calculus is primarily about "rates".

Recall:

$$\text{rate} = \frac{\text{change in quantity}}{\text{change in time}}$$

Ultimately in this course, we will find *instantaneous* rates, by building a limiting process of better and better approximations.

Example: The distance traveled by an object is recorded at various times:

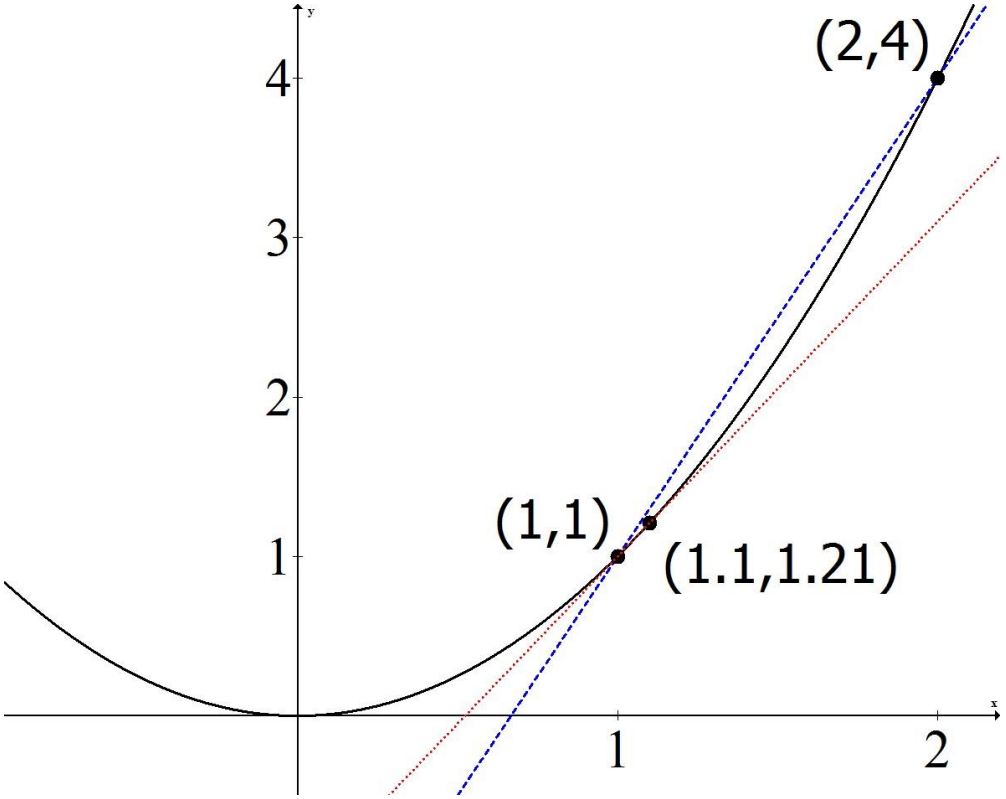
t (seconds)	0	1	2	3
Dist (meters)	0	1.2	4.5	10.4

1. What is the average velocity from t = 1 to t = 3?
2. What is the average velocity from t = 2 to t = 3?
3. What is the instantaneous velocity at t = 3?

Example:

Consider the function: $f(x) = x^2$

1. Find the slope of the *secant* line from x = 1 to x = 2.
2. Find the slope of the secant line from x = 1 to x = 1.1.



Ultimately, in this course we will find

f'(1) = `slope of the tangent at *x=1*'

$$= \lim_{h \to 0} \frac{f(1+h) - f(1)}{h}$$