

## Related Rates Class Examples

- [A] A spotlight sits on the floor, facing a wall 12 feet away.  
You are 6 feet tall, and you move from the wall towards the light at 2 feet per second.  
How quickly is your shadow on the wall growing when you are 4 feet from the wall ?
- [B] Two roads meet at Kvadrat Square at a 60 degree angle.  
On one road, a car is driving towards the square at 30 miles per hour.  
On the other road, a car is driving away from the square at 40 miles per hour.  
How quickly is the direct distance between the cars changing when the first car is 2 miles from the square, and the second car is 1 mile from the square ?
- [C] The base of a 12 foot tall conical tank has a radius of 8 feet.  
Water is draining out of the tank at  $16\pi$  cubic feet per minute.  
How quickly is the water level changing when the water is 2 feet high in the tank ?
- [D] A camera located on the ground is recording a watermelon falling from the roof of a building.  
 $t$  seconds after it is released, the watermelon will be  $200-16t^2$  feet above the ground.  
If the camera is 40 feet from the building, and aimed directly at the watermelon at all times,  
how quickly is the camera turning when the watermelon has fallen halfway down the building ?

[1] Draw a diagram, if possible.

**Do not label any numbers on the diagram, unless the quantities they represent NEVER change.**

[2] What rate of the change are you given, or can you find easily by differentiation ?

What quantity is/quantities are changing at that/those rate(s) ?

Label that quantity/those quantities onto your diagram.

[3] What quantity's rate of change do you want to find ?

Label that quantity onto your diagram.

Under what circumstance do you want the rate of change ?

(ie. for what values of the quantity/quantities in [2] and/or [3] ?)

[4] What equation connects the quantities in [2] and [3] ?

[5] Differentiate [4] implicitly with respect to time.

[6] Substitute all known information (you may need to use [4] or other equations).

[7] Solve for the desired rate of change in [3].