

Math 103 Day 9: Related Rates

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Outline

1 Related Rates

Related Rates is the most important application of calculus we have seen so far.

Example Air is being pumped into a spherical balloon so that its volume increases at a rate of $10\frac{cm}{s}$. How fast is the radius of the balloon increasing when the diameter is $4cm$?

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How To Approach These Problems

- 1 What quantities are given in the problem?
- 2 What is the unknown?
- 3 Draw a picture of the situation with labels.
- 4 Write an equation that relates the quantities.
- 5 Finish solving the problem.

Example A water tank has the shape of an inverted circular cone with base radius 2 meters and a height of 3 meters. If the water is being pumped into the tank at a rate of $3\frac{m^3}{min}$, find the rate at which the water level is rising when the water is 2 meters deep.

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Example A ladder 6ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of $.5\frac{ft}{sec}$, how fast is the top of the ladder sliding when it is 1ft above the ground?

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Example A round oil slick uniformly 0.1cm thick is being fed by a leak in an off shore oil rig at a rate of $2\frac{\text{m}^3}{\text{sec}}$. Sea turtles have bad eyesight and only see the oil as it is nearly on top of them. If sea turtles swim at a rate of $1\frac{\text{m}}{\text{sec}}$ and begins swimming away from the slick as they see it approaching, how far away from the oil rig does a turtle need to be to avoid being overcome by the slick.

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