

3.10-Related Rates

Idea: As certain quantities change over time, quantities which are related to them (usually via a formula) also change over time.

Example: Oil spilled from a broken tanker spreads in a circular pattern whose radius increases at a constant rate of 0.6 m/sec. How fast is the area of the spill increasing when the radius is 10 m?

Problem Solving Strategies: (p 217)

Examples:

A camera is positioned 800 m from a rocket launch pad. If the rocket rises vertically at 300 m/sec, how fast is the distance from the camera to the rocket changing when the rocket is 1000 m above ground?

In the example above, how fast is the angle of elevation of the camera changing at the same instant?

A man 6 feet tall is walking at the rate of 3 ft/sec toward a streetlight 18 ft high.

- a) How fast is length of his shadow changing when he is 12 feet from the light?
- b) How fast is the tip of his shadow moving at that instant?

A liquid is to be poured through a conical filter which is 40 cm tall and has a radius of 10 cm at the top. If the liquid is flowing out of the cone at a rate of $5 \text{ cm}^3/\text{min}$, how fast is the depth of the liquid changing at that instant?