

# Lesson 17

Read 3.9

More related rates problems

A 12 ft ladder is leaning against a wall and the bottom of the ladder is sliding away from the wall at a rate of 3 ft/sec. Meanwhile a firefighter is climbing up the ladder at a rate of 2 ft/sec. The firefighter is 6 ft from the bottom of the ladder when the ladder makes an angle of  $\frac{\pi}{3}$  with the ground. Find the rate of change of the height of the firefighter at the time when the angle between the ladder and the ground is  $\frac{\pi}{3}$ .

Sand is being dumped from a conveyor belt at a rate of  $2 \text{ m}^3 / \text{min}$  and forms a right circular cone . Assume the radius of the cone is always three times as large as its height. Find the rate at which the height of the cone changes when the height is 9 m.

A particle in the first quadrant moves along the curve  $y = x^3 + 3x$  in such a way that the  $x$  coordinate of its position  $P$  increases at a steady rate of 7 cm/sec. Let  $l$  be the line joining  $P$  to the origin. How fast is the angle of inclination of  $l$  changing when  $x = 2$  cm ?

A search light in a prison rotates counterclockwise at a rate of 3 rev/sec. The light shines on a long straight wall that is 40 ft from it. How fast is the light beam moving across the wall when the beam is hitting the wall at a spot which is 80 ft from the light ?

Water is leaking out of a cylindrical tank of height 8 m and diameter 6 m at a rate of  $10 \text{ m}^3 / \text{min}$ . Water is being pumped in at a constant rate  $C$ . If the water level is rising at a rate of  $0.5 \text{ m/min}$  when the height of the water is 3 m, what is  $C$  ?

In this problem you should use the law of cosines.

Two straight roads intersect at  $P$  at an angle of  $60^\circ$ . Car A is traveling away from  $P$  on one road, and car B on the other road. You are on car A and at a certain moment you have traveled 3 km away from  $P$  and you are moving at 80 km/hr. At that time your distance from car B is 7 km and the distance is increasing at a rate of 100 km/hr. At that time find the distance car B has traveled from  $P$  and its speed.

Two carts, A and B, are connected by a rope 28 ft long that passes over a pulley P. The point Q is on the floor 12 feet directly below P and between the carts. Cart A is being pulled away from Q at a speed of 7 ft/sec. How fast is cart B moving toward Q at the instant when A is 5 ft from Q ?