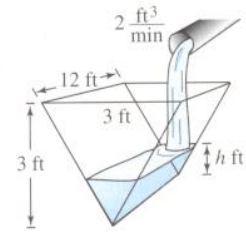




Related Rates Problem Set 2020

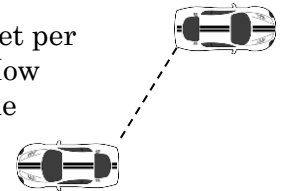


Question 1

A ladder of a length of 12 feet is sliding down a wall at the rate of 2 feet per second. When the bottom of the ladder is 8 feet from the base of the wall, at what rate is the bottom of the ladder moving away from the base of the wall?

Question 2

Mio and Freya drive on long **parallel** roads in **opposite** directions at 20 feet per second and 80 feet per second, respectively. The roads are 200 feet apart. How rapidly is the distance between them changing 5 seconds after they pass one another?



Question 3

A spotlight on the top of a police cruiser makes one revolution per second. The spotlight is 40 feet from a long straight wall. At what rate is the spot of light moving across the wall at the instant when the beam makes a 30° angle with the wall?

Question 4

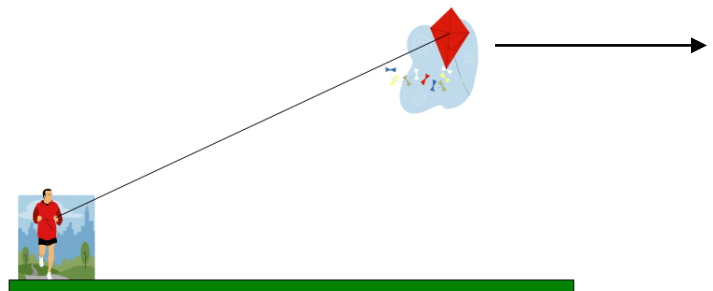
Suppose oil spills from a ruptured tanker and spreads in a circular pattern. If the radius of the oil spill increases at a constant rate of 1m/s how fast is the area of the spill increasing when the radius is 30 m?

Question 5

A basin has the shape of an inverted **cone** with height of 100 cm and radius at the top of 50 cm. Water is poured **into** the basin at the constant rate of 40 cubic cm/minute. At the instant when the volume of water in the basin is 486π cubic centimeters, find the rate at which the level of water is rising.

Question 6

A girl flies a kite at a height of 300 ft, the wind carrying the kite horizontally away from her at a rate of 25 ft/sec. How fast must she let out the string when the kite is a horizontal distance of 500ft away from her?



Question 7

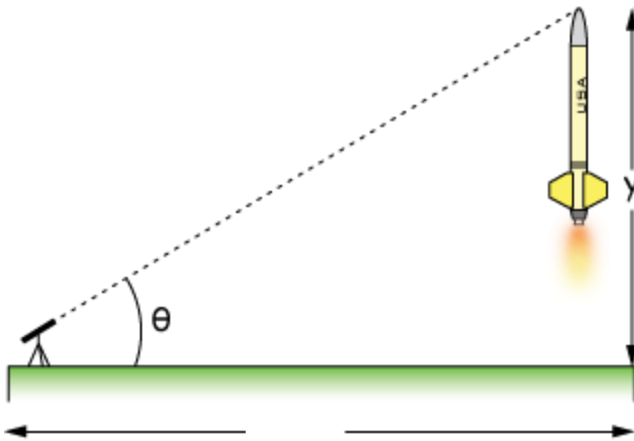
A boy and a girl start from the same point. The boy walks 70° [E of S] at 2.6 m/sec. The girl walks south at 3.2 m/sec. At what rate is the distance between the boy and girl changing after 45 minutes? [hints: **draw it** and use cosine law]

Question 8

A spotlight on the ground shines on a wall 12 m away. If a man 2 m tall walks from the spotlight toward the building at a speed of 2.3 m/s, how fast is the length of his shadow on the building decreasing when he is 4 m from the building?

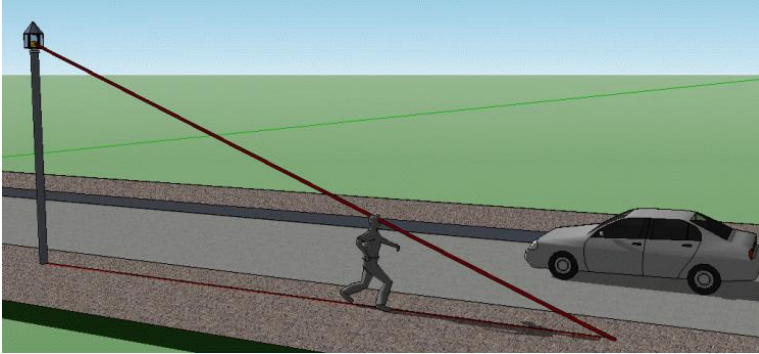
Question 9

A t.v. camera is positioned 4000 ft from the base of a rocket launching pad. The camera is aim so the rocket is always in sight. The rocket rises vertically and has a speed is 600 ft/s when it has risen 3000 ft. If the t.v. camera is always kept aimed at the rocket, how fast is the camera's angle of elevation changing at that moment?

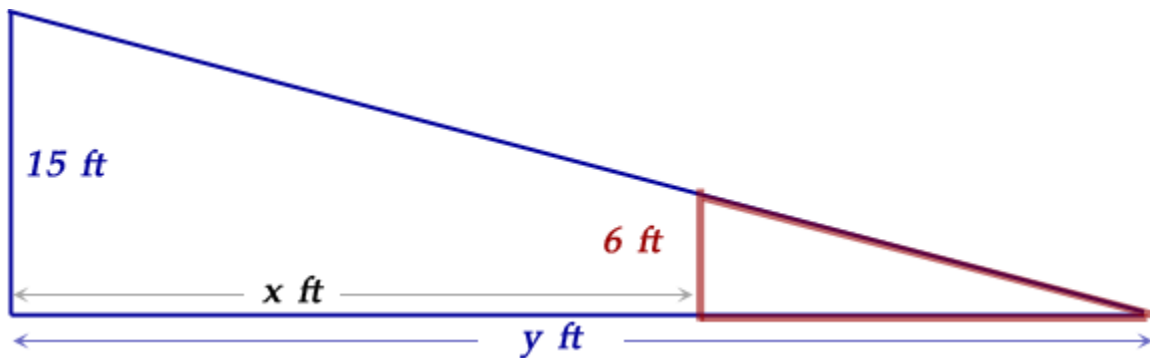


Question 10

A street light is mounted at the top of a 15ft pole. A man 6ft tall walks away from the pole at a rate of 5ft per second. How fast is the tip of his shadow moving when he is 40ft from the pole?



As the man goes farther from the street light, his shadow grows. This makes the rate at which the tip of his shadow moves different from how fast he is moving. Think about it.



You can see from the diagram above however that even though the rate of change of x is different from the rate of change of y , they are “linked” through *similar triangles*. Remember *similar triangles*? I will let you try the rest.

Answer to Question 1

2.236 feet/second

Answer to Question 2

$$\frac{ds}{dt} = \frac{500}{\sqrt{29}} \approx 92.84767 \text{ feet/second}$$

Answer to Question 3

$$\frac{dx}{dt} = 320\pi \approx 1005.30965 \text{ feet/second}$$

Answer to Question 4

188.5 m²/s

Answer to Question 5

$$\frac{dh}{dt} = 0.1572 \text{ cm/min}$$

Answer to Question 6

21.44 ft/s

Answer to Question 7

$$\frac{dz}{dt} = 3.36 \text{ m/s}$$

Answer to Question 8

$$\frac{dy}{dt} = -0.8625 \text{ m/sec}$$

Answer to Question 9

0.096 radians/s.

Answer to Question 10

8.33 ft/s