Lecture Fourteen Practice

Practice problems

Abstract. *Practice problems for Lecture Fourteen Content*

Problem. 1 : A snowball is melting at a rate of $324\pi\ mm^3/s$. At what rate is the radius decreasing when the volume of the snowball is $972\pi\ mm^3$?

The radius is decreasing at [ ] ? mm/s.

Problem. 2 : An experimental plane, currently overhead, is flying at 120 mph at an altitude of 32 thousand feet. How fast is the plane's distance from you increasing at the moment when the plane is flying over a point on the ground 24 thousand feet from you?

The distance between you and the plane is increasing by [ ] ? mph.

Problem. 3 : A road running north to south crosses a road going east to west at the point P. Cyclist A is riding north along the first road, and cyclist B is riding east along the second road. At a particular time, cyclist A is 39 hundred meters to the north of P and traveling at 32 meters per second, while cyclist B is 52 hundred meters to the east of P and traveling at 24 meters per second. How fast is the distance between the two cyclists changing?

The distance between the two cyclists is increasing by [ ] ?

meters per second.

Problem. 4 : A swing consists of a board at the end of a 26 feet long rope. Think of the board as a point P at the end of the rope, and let Q be the point of attachment at the other end. Suppose that the swing is directly below Q at time $t = 0$, and is being pushed by someone who walks at 10 feet per second from left to right. What is the angular speed of the rope in rad/s after 1 sec?

The angular speed of the rope is [?] rad/s.

Problem. 5 : It is night. Someone who is 4 feet tall is walking away from a street light at a rate of 8 feet per second. The street light is 12 feet tall. The person casts a shadow on the ground in front of them. How fast is the length of the shadow growing when the person is 3 feet from the street light?

The length of the shadow is growing at a rate of [?] ft/s.

Problem. 6 : Water pours into a fish tank at a rate of 0.3 cubic meters per minute. How fast is the water level rising if the base of the fish tank is a 2 meter by 3 meter rectangle?

$\frac{dh}{dt} =$ [?] m/min

Problem. 7 : A baseball diamond is a square whose sides are 90 feet long. Suppose a player running from second base to third base has a speed of 30 feet per second at the instant he is 20 feet from third base. At what rate is the player's distance from home plate changing at that instant?

[?] feet per second

Problem. 8 : Sand pouring from a chute forms a conical pile whose height is always equal to the diameter. If the height increases at a constant rate of 5 feet per minute, at what rate is the sand pouring from the chute when the pile is 10 feet high?

? cubic feet per minute