AP CALCULUS BC .

HIALEAH GARDENS HIGH. MARCH 2012.

Most common type of situations: motion along a curve, a relationship that involves Pythagoras's theorem, volume of sphere, area of a circle, circumference, a rocket being launched, volume of a cone.

1. A particle moves along the curve $y = 3x^2 - 6x$ so that the rate of change of the x-coordinate dx/dt is 2 units/sec. Find the rate of change of the y-coordinate, dy/dt when the particle is at the origin.
2. Suppose a particle moves along a circle with equations $x^2 + y^2 = 25$. If the particle is at the point (-4, 3) and the y-coordinate is increasing so that dy/dt = 2 units/secs, find the rate of change of the x-coordinate.
3. A circular pool of water is expanding at the rate of 16 pi in^2/sec. At what rate is the radius expanding when the radius is 4 inches?
4. A 25-foot long ladder is leaning against a wall and sliding toward the floor. If the foot of the ladder is sliding away from the base of the wall at a rate of 15 feet/sec, how fast is the top of the ladder sliding down the wall when the top of the ladder is 7 feet from the ground?
5. A spherical balloon is expanding at a rate of 60 pi in^3/sec. How fast is the surface area of the balloon expanding when the radius of the balloon is 4 inches?
6. An underground conical tank, standing on its vertex, is being filled with water at the rate of 18 pi ft^3/sec. If the tank has height of 30 feet and a radius of 15 feet, how fast is the water level rising when the water is 12 feet deep?
7. A rocket is rising vertically at a rate of 5400 miles per hour. An observer on the ground is standing 20 miles from the rocket's launch point. How fast –in radians per seconds—is the angle of elevation between the ground and the observer's line of sight of the rocket increasing when the rocket is at an elevation of 40 miles?