

Worksheet 4, Math 1A

Exponential Growth and Related Rates

Monday, October 14, 2013

- Strontium-90 has a half-life of 28 days.
 - A sample has a mass of 50 mg initially. Find a formula for the mass remaining after t days.
 - Find the mass remaining after 40 days.
 - How long does it take the sample to decay to a mass of 2 mg?
 - Sketch the graph of the mass function.
- A curve passes through the point $(0, 5)$ and has the property that the slope of the curve at every point P is twice the y -coordinate of P . What is the equation of the curve?
- Bob and Susan each invest \$10,000. Bob's investment has an annual interest rate of 6%, and Susan's has an annual interest rate of 7%. Both investments are compounded continuously.
 - What are the equivalent interest rates if these investments were compounded only annually?
 - How long will it take these investments to double in value?
 - At retirement age in 50 years, what will be the respective values of Bob's and Susan's investments?
- The radius of a sphere is increasing at a rate of 4 mm/s. How fast is the volume increasing when the diameter is 80 mm?
- A particle is moving along a hyperbola $xy = 8$. As it reaches the point $(4, 2)$, the y -coordinate is decreasing at a rate of 3 cm/s. How fast is the x -coordinate of the point changing at that instant?
- Gravel is being dumped from a conveyor belt at a rate of $30 \text{ ft}^3/\text{min}$, and its coarseness is such that it forms a pile in the shape of a (circular) cone whose base diameter and height are always equal. How fast is the height of the pile increasing when the pile is 10 ft high?
- A lighthouse is located on a small island 3 km away from the nearest point P on a straight shoreline, and its light makes four revolutions per minute. How fast is the beam of light moving along the shoreline when it is 1 km from P ?
- A Ferris wheel with a radius of 10 m is rotating at a rate of one revolution every 2 minutes. How fast is a rider rising when his seat is 16 m above ground level?
- The minute hand on a watch is 8 mm long and the hour hand is 4 mm long. How fast is the distance between the tips of the hands changing at one o'clock?