

Name _____ Date _____

Applications of the derivative 2

1) Predict the population of the city in 2010. Let 1990 be $t = 0$.

City	1990	2000	2010
Dhaka, Bangladesh	4.22 million	6.49 million	
London, U.K.	9.17 million	8.57 million	

2) Fill in the table.

Isotope	$\frac{1}{2}$ life	Initial mass m_0	$t = 1000$ yrs.	$t = 10,000$ yrs.
Ra - 226	1620 yrs.	10 g.		
C - 14	5730 yrs.			2 g.

3) A ladder 25 ft. long is leaning against the wall of a house. The base of the ladders is pulled away from the wall at a rate of 2 ft. per second.

a. How fast is the top of the ladder moving down the wall when the base is 7 feet from the wall?

b. Consider the triangle formed by the ladder, the ground and the wall. Find the rate at which the Area is changing when the base of the ladder is 7 feet from the wall.

c. Find the rate at which the angle between the ladder and the wall is changing when the base of the ladder is 7 feet from the wall.

4) The height of a rock thrown by an astronaut on the moon is modeled by

$$h = -\frac{27}{10}t^2 + 27t + 6, \quad h(\text{ft.}) \text{ and } t(\text{sec.})$$

a. Find the expression for the velocity and acceleration of the rock.

b. Find when the rock reaches its highest point ($v(t)=0$). What is its height at that time?

5) A conical container has a height of 9cm. and a diameter of 6cm. It is leaking water at a rate of $1\text{cm}^3/\text{min}$. Find the rate at which the water level h is changing when $h = 3\text{cm}$.