

Exponential Growth, Interest, and Logarithmic Differentiation

1. How long will it take an investment of \$12,000 to grow to \$15,000 if the investment earns interest at a rate of 8%/yr compounded monthly? What is the effective rate in this instance?
2. Sally is trying to decide who she wants to bank with. On the one hand, **Betsy, Bob, Betsy, and Bubba**, a prestigious midwestern banking company, will offer her 4% interest compounded semiannually. However, **Bank B** will offer her a rate of 3.9605% compounded continuously. Which bank will double Sally's money faster? (Round to 2 decimal places.) Which bank should Sally go with?
3. Differentiate the following functions:

(a) $y = x^{3x^2}$

(b) $y = (x^3 - 2x)^{\ln x}$

(c) $y = e^{\ln(x^2+1)}$

(d) $y = e^{\ln(x^2)+1}$

4. Carbon 14 has a half-life of 5770 years. Skeletal remains of the so-called Pittsburgh Man, unearthed in Pennsylvania, had lost 82% of the C-14 they initially contained. Determine the approximate age of the bones. What is the rate at which the amount of C-14 is decaying?
5. Use the results we found in class to show that the half-life of a substance is $-\frac{\ln 2}{k}$. Check this with the k you got in your answer to problem 4.
6. A population of rabbits grows exponentially. If the population doubles every 2 months, how long will it take for a population of 10 rabbits to grow to 1 million?