Applications Involving Logarithmic and Exponential Functions

1. Growth of a certain strain of bacteria is modeled by the equation $G = A(2.7)^{0.584t}$, where:
   G = final number of bacteria
   A = initial number of bacteria
   t = time (in hours)
   In approximately how many hours will 4 bacteria first increase to 2,500 bacteria?
   Round your answer to the *nearest hour*.

2. The amount A, in milligrams, of a 10-milligram dose of a drug remaining in the body after t hours is given by the formula $A = 10(0.8)^t$. Find, to the *nearest tenth of an hour*, how long it takes for half of the drug dose to be left in the body.

3. Depreciation (the decline in cash value) on a car can be determined by the formula $V = C(1-r)^t$, where V is the value of the car after t years, C is the original cost, and r is the rate of depreciation.
   If a car's cost, when new, is \$15,000, the rate of depreciation is 30%, and the value of the car is now \$3,000, how old is the car to the *nearest tenth of a year*?

4. The equation for radioactive decay is $p = (0.5)^{\frac{t}{H}}$, where p is the part of a substance with half-life H remaining after a period of time, t. A given substance has a half-life of 6,000 years. After t years, one-fifth of the original sample remains radioactive. Find t, to the *nearest thousand years*.

5. Sean invests \$10,000 at an annual rate of 5% compounded continuously, according to the formula $A = Pe^{rt}$, where A is the amount, P is the principal, $e = 2.718$, r is the rate of interest, and t is time, in years.
   Determine, to the *nearest dollar*, the amount of money he will have after 2 years.
   Determine how many years, to the *nearest year*, it will take for his initial investment to double.