COLLEGE ALGEBRA QUIZ

(1) After how long will an investment double if it is invested at a rate of 3.5%, compounded continuously?
Solution: 19.8 years

(2) The population of a state capital consisting of 2 counties doubled in 45 years. What was the exponential growth rate?
Solution: 1.5%

(3) How old was a bone that had lost 37% of its carbon-14 at the time it was found?
Solution: 3850 years

(4) The average speed of a person traveling by foot v, in feet per second, in a metropolitan area of population p, in thousands, is given by the function

$$v(p) = 0.327 \cdot ln(p) + 0.045$$

In a densely populated region, the average speed of a pedestrian is $3 ft/sec$. Find the population.
Solution: $8,405,968$

(5) The Asian-American population in the United States was 114 thousand, in 1900. This amount has increased exponentially to $20,417$ thousand in 2015, (Source: Pew Research Center). Assuming that the exponential growth model applies,
(a) Find the exponential growth rate k.
(b) Find the exponential growth function.
(c) Estimate the total population in 1960, in 2000, and in 2017.
(d) In what year will the Asian-American population reach 1 million?
Solution:
(a) $k \approx 0.045$,
(b) $P(t) = 114e^{0.045 \cdot t}$,
t is the number of years after 1900, P is in thousands pf people.
(c) 1960: 1696.289 thousand, 2000: 10261.953 thousand, 2017: 22052.879 thousand.
(d) in 2051.

(6) The population of United States was 203 million in 1970, and the exponential growth rate was 0.976% per year.
(a) Find the exponential growth function.
(b) What will the population be in 2020 in 2040?

(c) When will the population be 700 million?
(d) What is the doubling time?
Solution:
(a) $P(t) = 203e^{0.00976t}$, t is the number of years after 2070 and P is in millions
(b) 2020: 331 million; 2040: 402 million;
(c) about 127 years after 1970;
(d) 71 years.

(7) The barometric pressure P at an altitude a is given by

$$P = P_0 \cdot e^{-0.00005a}$$

where P_0 is the pressure at sea level, approximately 14.7 lb/in^2 (pounds per square inch). Find the height of North America's tallest mountain peak, Mount Denali if the barometric pressure at the top of the mountain is $7.5 \cdot 10^{-5}$ lb/in^2.
Solution: $20,310$ ft or $243,720$ in