Classroom Examples for Pre-Calculus #8

$$A = P(1+\frac{R}{N})^{NT}$$

Exponential Growth and Decay: $A = Pe^{kt}$ $A = Pe^{-kt}$ Decibels = $10\log\frac{I}{I_o}$

1) Solve $\log_3(8x-2) = 2 - \log_3 x$
2) If the half-life of plutonium-240 is 6,561 years, how long will it take for a 79 gram piece of plutonium to shrink to 25 grams? (round your answer to the nearest whole year)
3) Emily invests $85,416 in an account that earns 2.9% interest compounded continuously. If she leaves the money in the account for 18 years, how much money will be in the account? If she had invested that same amount in an account that offered the same interest rate for the same length of time but the interest was only compounded monthly, how much less money would she have?
4) Solve $\log_2(60x^2 + x + 75) = 3 + \log_2(6x^2 - 5)$
5) If the half-life of carbon-14 is 5,730 years, how old is a bone that has lost 12% of its carbon-14? (round your answer to the nearest whole number)
6) Emma invests $123,076 in an account that earns 4.1% interest compounded continuously. If, when she closes the account, the bank gives her $201,548.90, how many years did Emma keep the money in the bank? (round your answer to the nearest whole number)
7) Solve $\ln(-5x-6) + \ln(-3x+4) = \ln(29x)$
8) Back in 1981, Silas's grandfather discovered a rock on his farm that contained exactly 39.00 mg of thorium-229. Knowing that thorium-229 is radioactive, he put the rock in a lead-lined box for safe keeping. In 2014, Silas discovers the rock in the box and takes it to a lab for radiometric testing. They discover that the rock has exactly 38.88 mg of thorium-229 left in it. Based on this information, what is the half-life of thorium-229? (round your answer to the nearest whole number) **7,423…actual answer is 7,340
9) Caleb invests $245,724 in a bank account and leaves it there for 42 years earning interest that is compounded continuously. If he closes the account after the 42 years and the bank gives him $731,263.57, what interest rate was he earning throughout the 42 years? (round this answer, as a percent, to one decimal place) If Caleb had invested that same amount for the same amount of time and at the same interest rate in a bank that was compounding interest daily, how much money would Caleb have lost?
10) Solve $\log_2(3x^2 + 17x - 6) = \log_2(x+6) + 4$
11) Johnny goes to a rock concert where the loudness of the music is determined to be 134 decibels. If the intensity of the background noise is measured before the concert begins and found to be 15, how intense is the sound of the concert?

12) In 1904, the population of humans in the United States was 82 million people. In 2013, the population of humans in the United States was 315 million. If the human population in the United States grows at an exponential rate, when (in what year) will the human population of the United States reach 1 billion?

13) Solve $\log_{22}(7x^2 - 1x) + \log_{22}(3x + 4) = \log_{22}(x) + 1$

14) The magnitude of earthquakes is measured using the Richter scale. The formula for calculating the magnitude is $M = \log A - 2.48 + 2.76 \log D$ where M is the magnitude, A is the amplitude of the wave recorded on the seismograph measured in micrometers, and D is the distance the seismograph is away from the epicenter of the earthquake measured in kilometers. If you are standing next to a seismograph that records an earthquake of magnitude 6.2 and the amplitude of the wave on the machine is 11 micrometers, how far away from you was the epicenter of the earthquake? (round your answer to one decimal place)

15) Ronnie has a bad bacterial infection. Luckily for him, a new antibiotic has just been developed to fight this particular infection. In clinic trials, it was determined that it took one week for the drug to exponentially drop the number of infected cells in a patient from 87,000,000 to 60,000. If Ronnie takes this antibiotic immediately, the amount of the infected cells in his body will decrease exponentially over time. Ronnie is currently very sick and has 239,000,000 cells infected with the bacteria, but once the level of infected cells drops to 3,000, Ronnie will be considered cured. How many days will it take for Ronnie to be cured? (round your answer to the nearest whole number)