

Pre-Calculus Homework #8

- 1) Simplify $216^{\frac{2}{3}}$, $\log_8 4096$, $\left(\frac{256}{625}\right)^{\frac{3}{4}}$, and $\log_4 .015625$
- 2) Simplify $7\log_8 x - 2(3\log_8 y + 5\log_8 k)$
- 3) Graph $f(x) = 2\log_3(x+5) - 1$ and state the domain and range.
- 4) Solve $3^{2x+3} = 6^{3x-1}$ exactly and then approximate the answer rounded to three decimal places.
- 5) Expand $\log_5 \sqrt[9]{\frac{x^{12}}{a^6 m^{18}}}$
- 6) Solve $\log_2(3x - 4) = 5 - \log_2 x$
- 7) If the half-life of plutonium-239 is 24,065 years, how long will it take for a 56 gram piece of plutonium to shrink to 8 grams? (round your answer to the nearest whole year)
- 8) Olivia invests \$27,906 in an account that earns 3.7% interest compounded continuously. If she leaves the money in the account for 12 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 quarterly, how much less money would she have?
- 9) Solve $\log_3(86x^2 + 21x + 108) = 4 + \log_3(x^2 + 2)$
- 10) If the half-life of carbon-14 is 5730 years, how old is a bone that has lost 7% of its carbon-14? (round your answer to the nearest whole number)
- 11) Victoria invests \$57,867 in an account that earns 2.8% interest compounded continuously. If, when she closes the account, the bank gives her \$74,451.45, how many years did Victoria keep the money in the bank? (round your answer to the nearest whole number)
- 12) Solve $\ln(-12x + 1) + \ln(-x - 36) = \ln(420x)$

- 13) Back in 1974, Rebecca's grandfather discovered a rock on his farm that contained exactly 120 mg of radium-226. Knowing that radium-226 is radioactive, he put the rock in a lead-lined box for safe keeping. In 2016, Rebecca discovers the rock in the box and takes it to a lab for radiometric testing. They discover that the rock has exactly 117.836 mg of radium-226 left in it. Based on this information, what is the half-life of radium-226? (round your answer to the nearest whole number)
- 14) Max invests \$138,248 in a bank account and leaves it there for 30 years earning interest that is compounded continuously. If he closes the account after the 30 years and the bank gives him \$549,522.20, what interest rate was he earning throughout the 30 years? (round this answer, as a percent, to one decimal place) If Max had invested that same amount for the same amount of time and at the same interest rate in a bank that was compounding interest monthly, how much money would Max have lost?
- 15) Solve $\ln(2x^2 + 13x + 20) = \ln(x + 4) - 3$ exactly and approximately (rounded to three decimal places).
- 16) Tristan goes to a rock concert where the loudness of the music is determined to be 120 decibels. If the intensity of the background noise is measured before the concert begins and found to be 18, how intense is the sound of the concert?
- 17) In 1920, the population of humans on the planet Earth was 2 billion people. In 2004, the population of humans on the Earth was 6 billion. If the human population on Earth grows at an exponential rate, when (in what year) will Earth's population reach 10 billion?
- 18) Solve $\log_{14}(2x^2 + 10x) + \log_{14}(9x - 12) = \log_{14}(6x) + 1$
- 19) 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 5.6 and the amplitude of the wave on the machine is 8 micrometers, how far away from you was the epicenter of the earthquake? (round your answer to one decimal place)
- 20) Derek 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 4 days for the drug to exponentially drop the number of infected cells in a patient from 35,000,000 to 50,000. If Derek takes this antibiotic immediately, the amount of the infected cells in his body will decrease exponentially over time. Derek is currently very sick and has 175,000,000 cells infected with the bacteria, but once the level of infected cells drops to 2,000, Derek will be considered cured. How many days will it take for Derek to be cured? (round your answer to the nearest whole number)