Pre-Calculus Homework #22

1) Determine if the sequence –243, –224, –205, –186,… is arithmetic or geometric. Find an equation that models this sequence. Find the 37th term and determine which term the number 1,258 represents.

2) Evaluate: $\displaystyle\sum_{k=0}^{\infty} -5(\frac{1}{3})^k$

3) Joshua decides to capitalize on his math knowledge by starting an online help center to answer math questions. He charges $1.50 for each question he answers. Joshua answers 23 questions during his first week in business and is so successful that he answers 37 questions the next week, 51 questions the week after that, and 65 questions during the week after that. If this pattern continues for an entire year, how much money will Joshua have made?

4) Evaluate: $\displaystyle\sum_{k=0}^{14} 8(\frac{-3}{2})^k$

5) If a rubber ball is dropped from a height of 22 feet and bounces straight back up to three eighths of its initial height before falling back to the ground again and then repeats this pattern of bouncing up to three eighths of its previous height and falling back down again for exactly fifteen bounces and then you physically stop the ball just as it touches the ground for its sixteenth bounce, how far will the ball travel in feet, rounded to five decimal places?

6) What kind of series is $\displaystyle\sum_{k=1}^{\infty} \frac{(-1)^k}{2k}$ and state whether it converges or diverges. Write out the first ten terms of the sequence and find their sum exactly AND rounded to five decimal places.

7) Use the first fourteen terms of the harmonic sequence used to calculate π to approximate π to five decimal places.

8) The following represents all of the wavelengths of all of the musical notes for four octaves, rounded to one decimal place:

C note (20.8, 10.4, 5.2, 2.6), D note (18.5, 9.3, 4.6, 2.3), E note (16.5, 8.3, 4.1, 2.1), F note (15.6, 7.8, 3.9, 1.9), G note (13.9, 6.9, 3.5, 1.7), A note (12.4, 6.2, 3.1, 1.5), B note (11.0, 5.5, 2.8, 1.4), C# note (9.8, 4.9, 2.5, 1.2), D# note (17.5, 8.8, 4.4, 2.2), F# note (14.7, 7.4, 3.7, 1.8), G# note (13.1, 6.6, 3.3, 1.6), and A# note (11.7, 5.8, 2,9, 1.5)

Use this information along with your knowledge of harmonic series to determine and prove the three notes in an E chord.

9) Use the first twenty terms of the harmonic sequence used to calculate $\ln 2$ to approximate $\ln 2$ to four decimal places.

10) Determine if the series $169 + 196 + 225 + 256 + \dots$ is arithmetic, geometric, harmonic, quadratic, or cubic. Find a formula that models this series. Find the sum of the first 27 terms of this series without actually writing them all down and adding up the results.

11) What kind of series is $\sum_{k=1}^{\infty} \dfrac{1}{3k-1}$ and state whether it converges or diverges. Write out the first eight terms of the sequence and find their sum exactly AND rounded to five decimal places.

12) Use the first twenty-seven terms of the harmonic sequence used to calculate π to approximate π to five decimal places.

13) The following represents all of the wavelengths of all of the musical notes for four octaves, rounded to one decimal place:

C note (20.8, 10.4, 5.2, 2.6), D note (18.5, 9.3, 4.6, 2.3), E note (16.5, 8.3, 4.1, 2.1), F note (15.6, 7.8, 3.9, 1.9), G note (13.9, 6.9, 3.5, 1.7), A note (12.4, 6.2, 3.1, 1.5), B note (11.0, 5.5, 2.8, 1.4), C# note (9.8, 4.9, 2.5, 1.2), D# note (17.5, 8.8, 4.4, 2.2), F# note (14.7, 7.4, 3.7, 1.8), G# note (13.1, 6.6, 3.3, 1.6), and A# note (11.7, 5.8, 2,9, 1.5)

Use this information along with your knowledge of harmonic series to determine and prove the three notes in an A chord.

14) Use the first thirty terms of the harmonic sequence used to calculate $\ln 2$ to approximate $\ln 2$ to four decimal places.

15) Determine if the series $125 + 216 + 343 + 512 + \dots$ is arithmetic, geometric, harmonic, quadratic, or cubic. Find a formula that models this series. Find the sum of the first 23 terms of this series without actually writing them all down and adding up the results.

16) If you start keeping track of the yearly rainfall in your particular location on the first of this year, what is the expected value of record-breaking yearly rainfalls in the next 10 years? What would the expected value be for the next 20 years? (round your answers to the nearest whole numbers)

17) What kind of sequence is $1, -\dfrac{1}{5}, \dfrac{1}{9}, -\dfrac{1}{13}, \ldots$? Find a formula for the sum of that sequence and state whether the series converges or diverges. Find the sum of the first nine terms of the sequence exactly AND rounded to five decimal places.

18) The following represents all of the wavelengths of all of the musical notes for four octaves, rounded to one decimal place:

C note (20.8, 10.4, 5.2, 2.6), D note (18.5, 9.3, 4.6, 2.3), E note (16.5, 8.3, 4.1, 2.1), F note (15.6, 7.8, 3.9, 1.9), G note (13.9, 6.9, 3.5, 1.7), A note (12.4, 6.2, 3.1, 1.5), B note (11.0, 5.5, 2.8, 1.4), C# note (9.8, 4.9, 2.5, 1.2), D# note (17.5, 8.8, 4.4, 2.2), F# note (14.7, 7.4, 3.7, 1.8), G# note (13.1, 6.6, 3.3, 1.6), and A# note (11.7, 5.8, 2,9, 1.5)

Use this information along with your knowledge of harmonic series to determine and prove the three notes in a B chord.

19) What kind of sequence is $\dfrac{1}{2}, \dfrac{1}{5}, \dfrac{1}{8}, \dfrac{1}{11}, \ldots$? Find a formula for the sum of that sequence and state whether the series converges or diverges. Find the sum of the first eleven terms of the sequence and exactly AND rounded to five decimal places.

20) Your goal is to cross a vast desert that is 550 miles wide. You own a huge fleet of jeeps, with drivers, so you can use as many jeeps as needed to help get you across the desert. There are no gas stations or refueling options anywhere in this desert and, for safety reasons, the only gas you can bring with you is what will fit in the gas tank of each jeep, although each jeep can bring an empty gas can with them. If each jeep can go 250 miles on a tankful, and no jeeps or drivers can be left stranded in the desert, how many jeeps will it take for you to cross the desert safely?