Sequences

For problems 1 – 4 determine if the sequence converges or diverges and find the limit if it converges.

1. $\left\{ \dfrac{7n + 3n^2 - 10n^4}{1 + n^3 + 13n^4} \right\}_{n=1}^{\infty}$

2. $\left\{ \ln\left(4 + 25n\right) - \ln\left(27 + 3n\right) \right\}_{n=0}^{\infty}$

3. $\left\{ \cos\left(n\pi\right) \right\}_{0}^{\infty}$

4. $\left\{ \dfrac{(-1)^n \left(8 - n^2\right)}{9n + 7n^3} \right\}_{n=3}^{\infty}$

For problems 5 and 6 determine if the given sequence is increasing, decreasing or not monotonic. Also determine if the sequence is bounded, bounded above, bounded below or not bounded. Note that all answers must be justified with sufficient work and the bounded portion of the answers are a little tricky and will need the increasing/decreasing information in most cases to get. You'll probably also want to know whether or not the sequence converges and what its value is (provided it converges of course).

5. $\left\{ \dfrac{2 - 3n}{1 - n} \right\}_{n=2}^{\infty}$

6. $\left\{ \dfrac{5 + n}{5,250,000 + 10n^2} \right\}_{n=1}^{\infty}$

Series – The Basics

7. Answer each of the following questions about $\displaystyle\sum_{n=1}^{\infty} \dfrac{1 + n^2}{1 + n^4}$.

    (a) Strip out the first three terms of the series.

    (b) Given that $\displaystyle\sum_{n=1}^{\infty} \dfrac{1 + n^2}{1 + n^4} = 1.70701$ determine the value of $\displaystyle\sum_{n=4}^{\infty} \dfrac{1 + n^2}{1 + n^4}$.

Series – Convergence/Divergence

8. Given $d_n = \dfrac{2n^4 - 9n^2 + 1}{7n^4 + n^3 + n^2 + 4}$ determine if,

    (a) $\left\{ d_n \right\}_{n=7}^{\infty}$ is a convergent or divergent sequence.

    (b) $\displaystyle\sum_{n=7}^{\infty} d_n$ is a convergent or divergent infinite series.

9. Below are the partial sums for the series $\sum\limits_{n=0}^{\infty} a_n$. Does the series converge or diverge? If it converges

what does its value?

$$s_n = \frac{7n + \mathbf{e}^{-n}}{4 + 5n}$$

10. Is $\sum\limits_{n=1}^{\infty} 13$ a convergent or divergent series? If it is convergent give its value.

Series – Special Series

Determine if the following series converge or diverge. If the series converges give its value.

11. $\sum\limits_{n=1}^{\infty} \frac{(-3)^{1-2n}}{4^{2-n}}$

12. $\sum\limits_{n=3}^{\infty} \frac{(-3)^{1-2n}}{4^{2-n}}$

13. $\sum\limits_{n=4}^{\infty} \frac{-9}{10n}$

14. $\sum\limits_{n=4}^{\infty} \frac{6}{n^2 - 4n + 3}$