MATH 214 (R1) Winter 2008
Intermediate Calculus I

Problem Set #1

Completion Date: Friday January 18, 2008

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Question 1. [**Sec. 12.1, #12**] Find a formula for the general term a_n of the sequence assuming that the pattern of the first few terms continues.

$$\left\{ -\frac{1}{4}, \frac{2}{9}, -\frac{3}{16}, \frac{4}{25}, \dots \right\}$$

Question 2. [**Sec. 12.1, #22**] Determine whether the sequence $a_n = \dfrac{(-1)^n n^3}{n^3 + 2n^2 + 1}$ converges or diverges. If it converges, find the limit.

Question 3. [**Sec. 12.1, #26**] Determine whether the sequence $a_n = \arctan 2n$ converges or diverges. If it converges, find the limit.

Question 4. [**Sec. 12.1, #34**] Determine whether the sequence $a_n = \sqrt{n} - \sqrt{n^2 - 1}$ converges or diverges. If it converges, find the limit.

Question 5. [**Sec. 12.1, #36**] Determine whether the sequence $a_n = \dfrac{\sin 2n}{1 + \sqrt{n}}$ converges or diverges. If it converges, find the limit.

Question 6. [**Sec. 12.2, #20**] Determine whether the series

$$\sum_{n=1}^{\infty} \frac{e^n}{3^{n-1}}$$

is convergent or divergent. If it is convergent, find the sum.

Question 7. [**Sec. 12.2, #22**] Determine whether the series

$$\sum_{n=1}^{\infty} \frac{3}{n}$$

is convergent or divergent. If it is convergent, find the sum.

Question 8. [**Sec. 12.2, #24**] Determine whether the series

$$\sum_{n=1}^{\infty} \frac{(n+1)^2}{n(n+2)}$$

is convergent or divergent. If it is convergent, find the sum.

Question 9. [**Sec. 12.2, #28**] Determine whether the series

$$\sum_{n=1}^{\infty} [(0.8)^{n-1} - (0.3)^n]$$

is convergent or divergent. If it is convergent, find the sum.

Question 10. [Sec. 12.2, #30] Determine whether the series

$$\sum_{n=1}^{\infty} \ln\left(\frac{n}{2n+5}\right)$$

is convergent or divergent. If it is convergent, find the sum.

Question 11. [Sec. 12.2, #44] Find the values of x for which the series

$$\sum_{n=0}^{\infty} \frac{(x+3)^n}{2^n}$$

converges. Find the sum of the series for those values of x.

Question 12. [Sec. 12.3, #10] Determine whether the series

$$\sum_{n=1}^{\infty} (n^{-1.4} + 3n^{-1.2})$$

is convergent or divergent.

Question 13. [Sec. 12.3, #16] Determine whether the series

$$\sum_{n=1}^{\infty} \frac{3n+2}{n(n+1)}$$

is convergent or divergent.

Question 14. [Sec. 12.3, #24] Determine whether the series

$$\sum_{n=3}^{\infty} \frac{1}{n \ln n \ln(\ln n)}$$

is convergent or divergent.

Question 15. [Sec. 12.3, #32] Find the sum of the series

$$\sum_{n=1}^{\infty} \frac{1}{n^5}$$

correct to three decimal places.

Question 16. Show that the sequence

$$\alpha_n = \frac{q^n}{1+q^{2n}}$$

converges to the same limit 0 for both $|q| < 1$ and $|q| > 1$.