# Polytechnic University

## MA 1132 — Worksheet III
## Instructor: Manocha

**Due: February 28, 2007**

**You must show all of your work for problems (1)-(4) on a separate sheet of paper.**

(1) A geometric series has $-\frac{1}{3}$ as its 4th term and $-\frac{1}{81}$ as its 7th term.

(a) Find the sum of the first 10 terms.
(b) Find the sum of the squares of the first 10 terms.

(2) (Page 449, Problem 28) A ball is dropped from a height of 15 feet and bounces. Each bounce is $\frac{3}{5}$ of the height of the bounce before.

(a) Find an expression for the height to which the ball rises after it hits the floor for the $n$th time.
(b) Find an expression for the total vertical distance the ball has traveled when it hits the floor for the $n$th time. Express your answer in closed form.
(c) Considering that a ball dropped from a height of $h$ feet reaches the ground in $\frac{1}{4}\sqrt{h}$ seconds, find the time taken by the ball to stop bouncing.

(3) Find the sum of the series in each of the following:

(a) $2(0.1)^5 + 3(0.1)^6 + 2(0.1)^7 + 3(0.1)^8 + \cdots + 2(0.1)^{19} + 3(0.1)^{20}$
(b) $\displaystyle\sum_{n=0}^{\infty} \left[ \left(\frac{2}{3}\right)^n + \left(\frac{4}{5}\right)^n \right].$

(4) Discuss the convergence or divergence of each of the following:

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2+n+1}{3n^3+4n^2-8n-1}$
(b) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\ln 2^n}$
(c) $\displaystyle\sum_{n=0}^{\infty} \left( \left(\frac{3}{4}\right)^n + \frac{1}{n} \right).$
(d) $\displaystyle\sum_{n=1}^{\infty} \frac{n+7^n}{n7^n}$

**Attach these pages to the work that you are submitting.**

(5) You are given the following series. Which of the series are geometric? Circle the correct choice. You do not need to show work.

(a) $2 + 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots$

(b) $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \cdots$

(c) $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \cdots$

(d) $4 - 8 + 16 - 32 + 64 - \cdots$

(e) $1 + x + 2x^2 + 3x^3 + 4x^4 + \cdots$

(f) $2 + 2x + 4x^2 + 6x^3 + 8x^4 + \cdots$

(6) Find the sum of the following series:

$$y^2 + y^3 + y^4 + y^5 + \cdots$$

Assume $|y| < 1$. Circle the correct choice. You do not need to show work.

(a) $\frac{y^2}{1-y}$
(b) $\frac{y}{1-y}$
(c) $\frac{y^2}{1+y}$
(d) $\frac{y}{1+y}$
(e) $\frac{1}{1-y}$

(7) Find the sum of the following series:

$$1 - x + x^2 - x^3 + x^4 - \cdot$$

Assume $|x| < 1$. Circle the correct choice. You do not need to show work.

(a) $\frac{1}{1+x}$
(b) $\frac{1}{1-x}$
(c) $\frac{x}{1+x}$
(d) $\frac{x}{1-x}$
(e) $\infty$

(8) Consider the following series. Use the integral test to decide whether the series converges or diverges. Circle all convergent series. You do not need to show work.

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

(b) $\sum_{n=4}^{\infty} \frac{n}{n^2+8}$

(c) $\sum_{n=1}^{\infty} \frac{1}{e^n}$

(9) Use the comparison test to determine if the following statement is true or false. $\sum_{n=4}^{\infty} \frac{1}{n}$ diverges so $\sum_{n=4}^{\infty} \frac{1}{n-3}$ diverges. Circle the correct choice. You do not need to show work.

(a) True
(b) False

(10) Use the comparison test to determine if the following statement is true or false. $\sum_{n=1}^{\infty} \frac{1}{n^2}$ diverges so $\sum_{n=1}^{\infty} \frac{1}{n^2+4}$ diverges. Circle the correct choice. You do not need to show work.

(a) True
(b) False

(11) Use the ratio test to find the radius of the convergence of the power series.

$$\sum_{n=0}^{\infty} n^3 x^n$$

Circle the correct choice. You do not need to show work.

(a) $R = 0$
(b) $R = 1$
(c) $R = 2$
(d) $R = -\infty$
(e) $R = \infty$

(12) Use the ratio test to find the radius of the convergence of the power series.

$$\sum_{n=1}^{\infty} \frac{6^n (x-1)^n}{n}$$

Circle the correct choice. You do not need to show work.

(a) $R = 0$
(b) $R = 0.167$
(c) $R = 1$
(d) $R = -\infty$
(e) $R = \infty$