Name: KEY	ID: KEY	Sec: 11(12:50-1:40) 14(1:50-2:40)

MATH-102 Term-141 Class-QUIZ-on-Series

(show all your work and circle one letter to get a full mark or you will get zero)

1)The series $\sum_{n=1}^{\infty}\frac{(-n!)^4}{(4n+3)!}$ is

a)conditionally convergent
b)a divergent p series
c)divergent by the ratio test
d)a series for which the ratio test is inconclusive
e) absolutely convergent
f)none of the above

$|a_n| = \frac{(n!)^4}{(4n+3)!}$

$\left|\frac{a_{n+1}}{a_n}\right| = \frac{((n+1)!)^4}{(4n+7)!}\cdot\frac{(4n+3)!}{(n!)^4} = \frac{(n+1)^4}{(4n+7)(4n+6)(4n+5)(4n+4)} \to \frac{1}{4^4}$

4)The series $\sum_{n=1}^{\infty}\frac{1}{(\sqrt{n+1}+2)\sqrt{n}}$ is $\approx \sum\frac{1}{\sqrt{n}\sqrt{n}} = \frac{1}{n}$

a)diverges by the limit comparison test
b) convergent by the integral test
c) convergent by the ratio test
d) convergent by the root test
e) divergent by the ratio test
f)none of the above

$\lim_{n\to\infty}\frac{1/n}{\frac{1}{(\sqrt{n+1}+2)\sqrt{n}}} = \lim_{n\to\infty}\frac{(\sqrt{n+1}+2)\sqrt{n}}{n} = 1$ bot divg

2)The series $\sum_{n=1}^{\infty}\frac{3^n n^n}{2^{2n+1}}$ is $(a_n)^{1/n} = \frac{3n}{2^{2+\frac{1}{n}}}$

a)diverges by the root test
b)a convergent p series
c)converges by the root test
d)a series for which the root test is inconclusive
e) a divergent geometric series
f)none of the above

$\lim_{n\to\infty}(a_n)^{1/n} = \infty$

5)The series $\sum_{n=1}^{\infty}\frac{(-1)^{n-1}}{4^{n+1}+(n+2)^3}$ is $|a_n| = \frac{1}{4^{n+1}+(n+2)^3}$

a)conditionally convergent
b)divergent
c)absolutely convergent
d)convergent by the integral test
e)divergent by the alternating series test
f)none of the above

$(n+2)^3+4^{n+1} > 4^{n+1}$

$\frac{1}{(n+2)^3+4^{n+1}} < \frac{1}{4^{n+1}}$

by comparison test $\sum|a_n|$ Conv

3)The series $\sum_{n=1}^{\infty}(-1)^n(\sqrt{n+3}-\sqrt{n+2})$ is

a)diverges by the limit comparison test
b) conditionally convergent
c) absolutely convergent
d)diverges by the divergent test
e) divergent by the ratio test
f)none of the above

Study $\sum|a_n|$

$= \sum(\sqrt{n+3}-\sqrt{n+2})$

multiply by Conjugate

$= \sum\frac{1}{\sqrt{n+3}+\sqrt{n+2}}$ Similar to $\sum\frac{1}{\sqrt{n}}$

$\lim_{n\to\infty}\frac{1/\sqrt{n}}{\frac{1}{\sqrt{n+3}+\sqrt{n+2}}} = \lim\frac{\sqrt{n+3}+\sqrt{n+2}}{\sqrt{n}} = 2$

3)The series $\sum_{n=1}^{\infty}(3\sqrt{3}-\sqrt[n]{3})^{\frac{n}{2}}$ is

a)the root test is inconclusive
b) conditionally convergent
c) a divergent geometric series
d) convergent by the root test
e) divergent by the root test
f)none of the above

$(a_n)^{1/n} = (3\sqrt{3}-3^{1/n})^{1/2}$

$\lim(a_n)^{1/n} = (3\sqrt{3}-0)^{1/2}$

$= \sqrt{3\sqrt{3}} > 1$

divg by root test

KEY

7) If the sum of the first n terms of a series $\sum_{n=1}^{\infty} a_n$ is given by $S_n = \frac{2n}{n+1}$ then $a_{10} =$

a) 1/110
b) 4/110
c) 2/120
d) 2/101
e) 2/101
f) none of the above

$a_n = S_n - S_{n-1}$

$a_{10} = S_{10} - S_9$

$= \frac{20}{11} - \frac{18}{10}$

$= \frac{200-198}{110} = \frac{2}{110}$

10) The minimum number of terms needed to estimate the sum of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{(2n+3)^4}$ within 0.0001 (error) is

a) n=5
b) n=7
c) n=10
d) n=13
e) n=6
f) none of the above

$u_n = \frac{1}{(2n+3)^4}$

$u_{n+1} \le \frac{1}{10000}$

$\frac{1}{(2n+5)^4} \le \frac{1}{10000}$

$(2n+5)^4 \ge 10000$

$2n+5 \ge 10$

$2n \ge 5 \Rightarrow n \ge 2.5$

$n \ge 3$

the smallest choice is $n=5$

8) The series $\sum_{n=2}^{\infty} \frac{6}{n^2-1} = 3\sum \frac{2}{n^2-1} = 3\sum\left(\frac{1}{n-1} - \frac{1}{n+1}\right)$

$= 3\left\{\sum_{n=2} \frac{1}{n-1} - \frac{1}{n} + \sum_{n=2} \frac{1}{n} - \frac{1}{n+1}\right\}$

$= 3\left[1 - 0 + \frac{1}{2} - 0\right\}$

$= 3\left[\frac{3}{2}\right] = 9/2$

a) 9/2
b) 3
c) 3/2
d) 0
e) 6
f) none of the above

9) If $\{S_n\}$ is the sequence of partial sums of the series $\sum_{n=3}^{\infty}\left(\frac{1}{n} - \frac{1}{n+2}\right)$ then $S_n =$

$\sum_{n=3}\left(\frac{1}{n} - \frac{1}{n+2}\right) = \sum_{n=3}\left(\frac{1}{n} - \frac{1}{n+1}\right) + \sum_{n=3}\left(\frac{1}{n+1} - \frac{1}{n+2}\right)$

Here $S_n = \left(\frac{1}{3} - \frac{1}{n+1}\right) + \left(\frac{1}{4} - \frac{1}{n+2}\right)$

a) $\frac{1}{3} - \frac{1}{n+1} + \frac{1}{4} - \frac{1}{n+2}$
b) $2 - \frac{1}{n+1} - \frac{1}{n+2}$
c) $\frac{1}{3} - \frac{1}{n} + \frac{1}{4} - \frac{1}{n+2}$
d) $\frac{1}{6} - \frac{1}{n+1} - \frac{1}{n+2}$
e) $\frac{1}{3} - \frac{1}{n} + \frac{1}{4} - \frac{1}{n+1}$
f) none of the above