Review, Integral Test & Quiz

Unit 5 Day 5

ARRIVAL: Work on packet p. 5 & 6

Packet p. 5 & 6 Answers: (OMIT #8, 11,12, 13, 17 for now)

1. *DV* 2. *CV to* 0 3. *CV to* 1 4. *CV to* 0 5. *CV to* 0

6. *DV*; *divergence test* ($\lim$ *of sequence* $\neq 0$)

7. *CV*; *geometric* ($|r| < 1$) 8. *CV*; *telescoping to* $\frac{3}{2}$

9. *DV*; *compare to harmonic* 10. *CV*; p *– series* ($p > 1$)

11. *DV*; int *egral test* 12. *CV*; int *egral test*

13. *CV*; *telescoping to* 5.5

14. *C* 15. *B* 16. *A* 17. *C* 18. *E*

QUIZ—30 minutes MAX

Summary So Far

- Geometric Series
  - Examine *r* value
- Test for Divergence
  - Divergent OR INCONCLUSIVE
- P-Series (Including Harmonic Series)
- Telescoping Test

Up Next . . . Integral Test

The Integral Test

Suppose f is a **continuous, positive, decreasing** function for all $x \geq a$ and $b_n = f(n)$.

Then:

$\int_a^{\infty} f(x)dx$ *and* $\sum_{n=a}^{\infty} b_n$ *either*

BOTH converge or BOTH diverge.

Explore the following P-series using the integral test:

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \ldots$$

Let $f(x) = \frac{1}{x^2}$

Is *f(x)* continuous? ____

Positive? ___

Decreasing? ____ (Think derivative.)

Now we can do the Integral Test

$$\int_1^{\infty} \frac{1}{x^2}\,dx = \lim_{b\to\infty}\int_1^b \frac{1}{x^2}\,dx = \lim_{b\to\infty}\left(-\frac{1}{x}\right)_1^b$$

$$= -\frac{1}{\infty} - \left(-\frac{1}{1}\right) = 0 + 1 = 1$$

Therefore $\sum_{n=1}^{\infty} \frac{1}{n^2}$ converges

It does NOT mean that it converges to 1.

Just that it converges.

Integral Test Ex:

1. $\sum_{n=1}^{\infty} \frac{2}{3n+5}$

2. $\frac{\ln 2}{2} + \frac{\ln 3}{3} + \frac{\ln 4}{4} + \ldots$

3. $\sum_{n=1}^{\infty} ne^{-n^2}$