Study Guide - Multiple Choice (Typed)

D 1. $\sum_{n=1}^{\infty} \frac{n3^n}{x^n}$

$\lim_{n\to\infty} \left| \frac{(n+1)3^{n+1}}{x^{n+1}} \cdot \frac{x^n}{n3^n} \right|$

$\lim_{n\to\infty} \left| \frac{(n+1)(3)}{x\,n} \right|$

$\left| \frac{3}{x} \right| < 1$

x must be > 3 for $\frac{3}{x} < 1 \Rightarrow$ **D**

★ We did this one WRONG in class. Use this answer. SORRY!

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

$\lim_{n\to\infty} \frac{2n}{n+3} = 2 \neq 0$ Diverges by n^{th} term test

II $\sum_{n=1}^{\infty} \frac{-8}{(-3)^n} = \sum_{n=1}^{\infty} -8\left(\frac{-1}{3}\right)^n$

convergent geometric $|r|<1$

$S = \frac{8/3}{1+(1/3)} = \frac{8}{3} \cdot \frac{3}{4} = 2$

III. $\sum_{n=0}^{\infty} \left(\frac{1}{2^n}\right)$

convergent geometric $|r|<1$

$S = \frac{1}{1-1/2} = 2$

3. $\ln(1-x)$ =

A

E

4. $\lim_{k\to\infty} \left| \frac{(x+1)^{k+1}}{(k+1)^2} \cdot \frac{k^2}{(x+1)^k} \right|$

$\lim_{k\to\infty} \left| \frac{(x+1)\,k^2}{(k+1)^2} \right|$

$|x+1| < 1$

$x+1 < 1 \qquad x+1 > -1$

$x < 0 \qquad x > -2$

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

p-series $p > 1$ converges

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

Alternating

$\lim_{n\to\infty} \frac{1}{k^2} = 0$

$a_{n+1} \le a_n$ So converges

5. B $x < -1$ creates a p-series

$p > 1$

6. I - No b/c $a_{n+1} \not\le a_n$

$S_1 = 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{25} + \ldots \frac{1}{2^n}$ convergent geometric $r = \frac{1}{2}$

$S_2 = -\frac{1}{9} - \frac{1}{25} - \frac{1}{49} - \frac{1}{81} - \frac{1}{121}$

$\frac{-1}{(n+1)^2}$ converges

$S_1 + S_2$ converges

p. 571 (blue book - thm 8.7)

D

7. D

D 8. $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!}$

$\cos 2x = 1 - \frac{(2x)^2}{2!}$

$= 1 - \frac{4x^2}{2!}$

$= 1 - 2x^2$