List of suggested exercises, Section 9.1-4
For the DGD of June 26th and 28th.

Sequences (Section 9.1)

(1) For each of the following sequence, write down the 5 first terms, and decide whether it congerges or not. If it does, find the limit.

$$(\#22)\quad (-0.3)^n \quad (\#23)\quad 3+e^{-n} \quad (\#29)\quad \frac{\sin(n)}{n} \quad (\#27)\quad \frac{2n+1}{n} \quad (\#30)\quad \frac{2n+(-1)^n5}{4n+(-)^n3}$$

(2) Find a recursive definition for the sequence:

$$(\#48)\quad 3,5,9,17,33,\ldots \qquad (\#50)\quad 1,3,6,10,15,\ldots \qquad (\#51)\quad 1,2,\frac{3}{2},\frac{5}{3}.\frac{8}{5},\frac{13}{8},\ldots$$

Series (Sections (9.2-4)

(1) For each of the following sequence of number, decide which are the first terms of a geometric series and which are not. For those who are, compute the value of the corresponding geometric series, if it exists.

$$3+12+48+192+768+\cdots \qquad \frac{1}{3}+\frac{1}{2}+\frac{3}{4}+\frac{9}{8}+\frac{27}{16}+\cdots$$

$$\frac{1}{2}+\frac{3}{8}+\frac{9}{32}+\frac{27}{128}+\frac{81}{512}+\cdots \qquad \frac{1}{3}+\frac{1}{4}+\frac{2}{16}+\frac{9}{64}+\frac{27}{256}+\cdots$$

$$\frac{1}{256}-\frac{1}{160}+\frac{1}{100}-\frac{2}{125}+\frac{16}{625}+\cdots \qquad \frac{1}{27}-\frac{1}{63}+\frac{1}{146}-\frac{1}{353}+\frac{3}{2401}+\cdots$$

(2) (exercise numbers are from Section 9.3). For each of the following series, decide whether or not they diverge. If they converge, gives their value.

$$(\#10)\quad \sum_{n=0}^{\infty}\frac{3}{n+2} \qquad (\#11)\quad \sum_{n=1}^{\infty}\frac{3}{(2n-1)^2} \qquad (\#16)\quad \sum_{n=1}^{\infty}\left(\left(\frac{3}{4}\right)^n+\frac{1}{n}\right)$$

$$(\#17)\quad \sum_{n=1}^{\infty}\frac{n+2^n}{n2^n} \qquad (\#18)\quad \sum_{n=1}^{\infty}\frac{\ln(n)}{n}$$

(3) Find the value of the following series:

$$\sum_{n=1}^{\infty}\ln\left(\frac{n+1}{n}\right) \qquad \sum_{n=4}^{\infty}\frac{1}{n(n+2)} \qquad \sum_{n=2}^{\infty}\frac{1}{(3n-2)(3n+1)}$$

$$\sum_{n=1}^{\infty}\ln\left(\frac{n}{2n+5}\right) \qquad \sum_{n=3}^{\infty}\left(\frac{-3}{\pi}\right)^{n-1} \qquad \sum_{n=2}^{\infty}3^{-n}8^{n+1}$$

$$\sum_{n=1}^{\infty}(-1)^{n-1}\frac{3^{2n}}{2^{3n+1}} \qquad \sum_{n=5}^{\infty}\frac{1}{e^{2n}} \qquad \sum_{n=1}^{\infty}\frac{2n+1}{n^2(n+1)^2} \qquad \sum_{n=1}^{\infty}\left(\frac{-3}{\pi}\right)^{n-1}$$

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

(4) Express the following numbers as a series, then as a ratio of integers:

$$0.2\overline{5} = 0.255555\cdots \qquad 0.\overline{307} = 0.307307307\cdots \qquad 1.1\overline{23} = 1.123232323\cdots$$

(5) (Section 9.4) Decide whether the following integrals converges or diverges. State the test you are using. Make sure to verify that the hypotheses are satisfied.

(#5) $\sum_{n=1}^{\infty} \frac{1}{n^4 + e^n}$ (#9) $\sum_{n=1}^{\infty} \frac{2^n + 1}{n2^n - 1}$ (#11) $\sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!}$

(#15) $\sum_{n=1}^{\infty} \frac{2^n}{n^3 + 1}$ (#16) $\sum_{n=1}^{\infty} (-1)^n \left(2 - \frac{1}{n}\right)$ (#19) $\sum_{n=1}^{\infty} \cos(n\pi)$

$\sum_{n=1}^{\infty} \frac{2n^4 + n^3 - n + 4}{\sqrt[3]{5n^{17} - 2n^3 + 6}}$ (#30) $\sum_{n=1}^{\infty} \frac{1}{2\sqrt{n} - \sqrt{n+2}}$ (#31) $\sum_{n=1}^{\infty} \left(\frac{1}{2n-1} - \frac{1}{2n}\right)$

(#48) $\sum_{n=1}^{\infty} \frac{\sin(x)}{n^2}$ (#51) $\sum_{n=2}^{\infty} \frac{3}{\ln(n^2)}$ (#53) $\sum_{n=1}^{\infty} \frac{n(n+1)}{\sqrt{n^3 + 2n^2}}$

(6) Approximate the following series within 0.001.

(#54) $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n}$ (#55) $\sum_{n=1}^{\infty} \left(-\frac{2}{3}\right)^{n-1}$ (#56) $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{(2n)!}$

(7) Determine if the following series are absolutely convergent, conditionally convergent or divergent.

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

$\sum_{n=1}^{\infty} \frac{(-2)^n}{n3^{n+1}}$ $\sum_{n=1}^{\infty} \frac{\sin(2n)}{n^2}$ $\sum_{n=1}^{\infty} \frac{(-1)^n \arctan(n)}{n^3}$

$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}5^{n-1}}{(n+1)^2 4^{n+2}}$ $\sum_{n=1}^{\infty} \frac{(-2)^n n^2}{(n+2)!}$ $\sum_{n=1}^{\infty} \left(\frac{1-3n}{1+4n}\right)^n$

$\sum_{n=1}^{\infty} \frac{(-n)^n}{5^{2n+3}}$ $\sum_{n=1}^{\infty} \frac{n!}{(-n)^n}$ $\sum_{n=1}^{\infty} \frac{\cos\left(n\frac{\pi}{6}\right)}{n\sqrt{n}}$