

$$[1][a] (-1)^1(3) + (-1)^3(5) + (-1)^5(7) + (-1)^7(9) + (-1)^9(11) + (-1)^{11}(13)$$

$$= \underline{-3-5+7+9-11-13} \quad \left(\frac{1}{2}\right)$$

$$= \underline{-16} \quad \left(\frac{1}{2}\right)$$

$$[b] \quad \underline{\frac{2}{4n^2-1} = \frac{2}{(2n-1)(2n+1)} = \frac{A}{2n-1} + \frac{B}{2n+1}} \quad \left(\frac{1}{2}\right)$$

$$2 = A(2n+1) + B(2n-1)$$

$$n = \frac{1}{2}: 2 = 2A \rightarrow A = 1$$

$$n = -\frac{1}{2}: 2 = -2B \rightarrow B = -1$$

$$\sum_{n=1}^{\infty} \left(\frac{1}{2n-1} - \frac{1}{2n+1} \right) = \left(\frac{1}{1} - \frac{1}{3} \right) + \left(\frac{1}{3} - \frac{1}{5} \right) + \left(\frac{1}{5} - \frac{1}{7} \right) + \dots$$

$$\underline{S_n = \left(\frac{1}{1} - \frac{1}{3} \right) + \left(\frac{1}{3} - \frac{1}{5} \right) + \dots + \left(\frac{1}{2n-1} - \frac{1}{2n+1} \right)}$$

$$\underline{= 1 - \frac{1}{2n+1}} \quad \left(\frac{1}{2}\right)$$

$$\underline{\lim_{n \rightarrow \infty} \left(1 - \frac{1}{2n+1} \right) = 1 \text{ CONV}} \quad \left(\frac{1}{2}\right)$$

$$[c] \quad \left\{ \frac{2^n}{n^2+1} \right\} = \left\{ \frac{2}{2}, \frac{4}{5}, \frac{8}{10}, \frac{16}{17} \right\}$$

$$\left(\frac{1}{2}\right)$$

OK IF $\frac{8}{10}$ SIMPLIFIED
TO $\frac{4}{5}$

$a_2 = a_3$ NEITHER
INCREASING NOR
DECREASING

IE. NOT MONOTONIC

$$\left(\frac{1}{2}\right)$$

$$[2][a] \quad 0 < \frac{\cos^2 n}{100n+n^4} < \frac{1}{100n+n^4} < \frac{1}{n^4} \quad \textcircled{1}$$

$$\star \textcircled{\frac{1}{2}} \quad \sum_{n=1}^{\infty} \frac{1}{n^4} \text{ CONV (p-SERIES } p=4 > 1) \quad \textcircled{\frac{1}{2}}$$

$$\star \textcircled{\frac{1}{2}} \quad \text{SO } \sum_{n=1}^{\infty} \frac{\cos^2 n}{100n+n^4} \text{ CONV (COMP)} \quad \textcircled{\frac{1}{2}}$$

★
 ◎ POINTS
 IF YOU SAY
 "CONV" OR
 "DIV" WITHOUT
 NAME OF
 TEST

$$[b] \quad \frac{600n+2^n}{6^n+200n}, \quad \frac{2^n}{6^n} > 0 \quad \textcircled{1} \quad \text{OK IF } \frac{2^n}{6^n} \text{ SIMPLIFIED TO } \left(\frac{1}{3}\right)^n$$

$$\lim_{n \rightarrow \infty} \frac{600n+2^n}{6^n+200n} = \lim_{n \rightarrow \infty} \frac{600n+2^n}{6^n+200n} \cdot \frac{6^n}{2^n} \quad \textcircled{1}$$

$$= \lim_{n \rightarrow \infty} \left(\frac{600n}{2^n} + 1 \right) \left(\frac{1}{1 + \frac{200n}{6^n}} \right) \quad \textcircled{1}$$

$$\textcircled{\frac{1}{2}} \quad \lim_{n \rightarrow \infty} \frac{n}{2^n} = \lim_{n \rightarrow \infty} \frac{1}{2^n \ln 2}$$

$$= 0$$

$$\lim_{n \rightarrow \infty} \frac{n}{6^n} = \lim_{n \rightarrow \infty} \frac{1}{6^n \ln 6}$$

$$= 0$$

$$\star = (0+1) \left(\frac{1}{1+0} \right) = 1 \neq 0 \quad \textcircled{\frac{1}{2}} \quad \textcircled{\frac{1}{2}} = 0$$

$$\sum_{n=1}^{\infty} \frac{2^n}{6^n} = \sum_{n=1}^{\infty} \left(\frac{1}{3} \right)^n \text{ CONV (GEOMETRIC } |r| = \left| \frac{1}{3} \right| = \frac{1}{3} < 1) \quad \textcircled{\frac{1}{2}}$$

$$\text{SO } \sum_{n=1}^{\infty} \frac{600n+2^n}{6^n+200n} \text{ CONV (LM COMP)} \quad \textcircled{\frac{1}{2}}$$



$$\begin{aligned}
 [c] \lim_{n \rightarrow \infty} (1 - \sin \frac{2}{n})^n &= \lim_{n \rightarrow \infty} (e^{\ln(1 - \sin \frac{2}{n})})^n \\
 &= \lim_{n \rightarrow \infty} e^{n \ln(1 - \sin \frac{2}{n})} \\
 &= e^{\lim_{n \rightarrow \infty} n \ln(1 - \sin \frac{2}{n})}
 \end{aligned}$$

$$\stackrel{(\frac{1}{2})}{=} \boxed{e^{-2}} \neq 0 \stackrel{(\frac{1}{2})}{=}$$

$$\boxed{\sum_{n=1}^{\infty} (1 - \sin \frac{2}{n})^n \text{ DIV (DIV TEST)}}$$

$$\stackrel{(\frac{1}{2})}{=}$$



$$\begin{aligned}
 &\stackrel{(1)}{\lim_{n \rightarrow \infty} n \ln(1 - \sin \frac{2}{n})} \\
 &= \lim_{n \rightarrow \infty} \frac{\ln(1 - \sin \frac{2}{n})}{\frac{1}{n}} \\
 &= \lim_{n \rightarrow \infty} \frac{1}{1 - \sin \frac{2}{n}} \cdot \cos \frac{2}{n} \cdot \frac{-2}{n^2} \\
 &\quad \quad \quad \frac{-\frac{1}{n^2}}{} \\
 &= \boxed{\lim_{n \rightarrow \infty} - \frac{2 \cos \frac{2}{n}}{1 - \sin \frac{2}{n}}} \\
 &= \frac{-2 \cos 0}{1 - \sin 0} \quad (1) \\
 &= \boxed{-2} \\
 &\quad \quad \stackrel{(\frac{1}{2})}{=}
 \end{aligned}$$