(1) $\begin{vmatrix} 1 & 0 & 3 & -2 \\ 2 & -2 & -1 & 1 \\ 1 & 1 & 4 & 0 \\ 1 & -1 & 2 & 4 \end{vmatrix} = \begin{vmatrix} 1 & 0 & 3 & -2 \\ 0 & -2 & -7 & 5 \\ 0 & 1 & 1 & 2 \\ 0 & -1 & -1 & 6 \end{vmatrix} = (-1)^{1+1} \cdot 1 \begin{vmatrix} -2 & -7 & 5 \\ 1 & 1 & 2 \\ -1 & -1 & 6 \end{vmatrix}$

$= \begin{vmatrix} -2 & -7 & 5 \\ 1 & 1 & 2 \\ 0 & 0 & 8 \end{vmatrix} = -16 - (-56) = 40$

(2) $\sum_{n=1}^{\infty} \underbrace{\frac{n^2-1}{n^3+2n}}_{a_n \geq 0}$ LSK $b_n = \frac{1}{n}$, $b_n > 0$

$\sum \frac{1}{n}$ D

$\lim_{n\to\infty} \frac{a_n}{b_n} = \lim \frac{n^3-n}{n^3+2n} = \lim \frac{1-\frac{1}{n^2}}{1+2/n^2} = 1 \in (0,\infty)$

$\Rightarrow \sum a_n$ D

(3) $\int e^{x+1} + x + \frac{2x^2}{x^2+1}\, dx = \int e^{x+1} + x + 2 \frac{x^2+1-1}{x^2+1}\, dx$

$= e^{x+1} + \frac{x^2}{2} + 2(x - \arctan x)$

$x \in \mathbb{R}$

(1) $\begin{vmatrix} 1 & 0 & 3 & -2 \\ 2 & -2 & -1 & 1 \\ 1 & 1 & 4 & 0 \\ 1 & -1 & 2 & 3 \end{vmatrix} = \begin{vmatrix} 1 & 0 & 3 & -2 \\ 0 & -2 & -7 & 5 \\ 0 & 1 & 1 & 2 \\ 0 & -1 & -1 & 5 \end{vmatrix} = (-1)^{1+1} \cdot 1 \cdot \begin{vmatrix} -2 & -7 & 5 \\ 1 & 1 & 2 \\ -1 & -1 & 5 \end{vmatrix}$

$= \begin{vmatrix} -2 & -7 & -5 \\ 1 & 1 & 2 \\ 0 & 0 & 7 \end{vmatrix} = -14 + 49 = \underline{\underline{35}}$

(2) $\sum_{n=1}^{\infty} \underbrace{\frac{\sqrt{n}}{n^3+2n}}_{a_n \geq 0}$ LSK s $b_n = \frac{\sqrt{n}}{n^3} \geq 0$

$= n^{-5/2}$ $\quad \sum n^{-5/2}$ k

$\lim_{n \to \infty} \frac{a_n}{b_n} = \lim \frac{\sqrt{n}}{n^3+2n} \cdot \frac{n^3}{\sqrt{n}} = \lim \frac{1}{1+\frac{2}{n^2}} = 1 \in (0, \infty)$

$\Rightarrow \sum a_n$ k

(3) $\int 2e^{x+1} + \cos x + \frac{3x^2}{x^2+1}\, dx = \int 2e^{x+1} + \cos x + 3\left(\frac{x^2+1}{x^2+1} - \frac{1}{x^2+1}\right) dx$

$\overset{c}{=} 2e^{x+1} + \sin x + 3x - 3\arctan x$ $\qquad x \in \mathbb{R}$