E2-212 MATRIX THEORY: ASSIGNMENT 4

Question 1. *For $\mathbf{x}, \mathbf{y} \in \mathbb{R}^n$ and the usual inner product $\langle \mathbf{x}, \mathbf{y} \rangle = \mathbf{y}^T \mathbf{x}$, prove:* *(7 points)*
(a) $\langle \mathbf{x}, \mathbf{y} \rangle \leq \|\mathbf{x}\|_1 \|\mathbf{y}\|_1$.
(b) $\langle \mathbf{x}, \mathbf{y} \rangle \leq n \|\mathbf{x}\|_\infty \|\mathbf{y}\|_\infty$.
When is equality achieved for each of the above?

Question 2. *Evaluate the determinant of* $\mathbf{A} = \begin{bmatrix} 552 & 5 & \frac{\pi^2}{4} & 347.86 \times 10^{15^{83^{11}}} \\ 4070 & 37 & 5 & \cos(13.14) \\ 8470 & 77 & 11 & 5 \\ 3080 & 28 & 4 & 2 \end{bmatrix}$. *(3 points)*