3) a) i) yes since $|a_n| = \left|\frac{2e^{\pi n i}}{n^2+2}\right|$ 8

$$= \left|\frac{2}{n^2+2}\right| < \left|\frac{2}{n^2}\right| = 2\left|\frac{1}{n^2}\right|$$

Basic convergent sequence.

ii) $\left(\frac{n^2-1}{n^2+1}\right)\sinh\left(\frac{n\pi i}{3}\right)$

$n = 3k+1$ $\left(\frac{(3k)^2-1}{(3k)^2+1}\right)\sin(\pi k i)$

$= \frac{1-1/9k^2}{1+1/9k^2}\sin(\pi k i)$

k even $\lim = 1 \times 0 = 0$

k odd

$n = 6k+1$

$$a_n = \frac{(6k+1)^2-1}{(6k+1)^2+1}\sinh\left(\frac{(6\pi k+1)\pi i}{3}\right)$$

$$= \frac{1-1/(6k+1)^2}{1+1/(6k+1)^2}\sin\left(\frac{\pi i}{3}\right) \to \frac{\sqrt{3}}{2}$$