1. Show that for $n \neq 3, 3^n > n^n$.

2. Show that for $n \geq 3$ $\quad \dfrac{1}{n+1} + \dfrac{1}{n+2} + \ldots + \dfrac{1}{2n} > \dfrac{3}{5}$.

3. Show that for $n \geq 1$ $1 + \dfrac{1}{\sqrt{2}} + \dfrac{1}{\sqrt{3}} + \ldots + \dfrac{1}{\sqrt{n}} < 2\sqrt{n}$.

4. If $u_n = 3^{4n+2} + 2 \cdot 4^{3n+1}$, show that u_n is divisible by 17 for $n \geq 1$.

5. Show that $7^n + 11^n$ is divisible by 9 for odd $n \geq 1$.

6. If $u_1 = 2$, $u_2 = 16$ and $u_n = 8u_{n-1} - 15u_{n-2}$ for $n \geq 3$, show that $u_n = 5^n - 3^n$ for $n \geq 1$.

7. If $u_n = 5^n - 4n - 1$, show that $u_n > 0$ for $n \geq 2$.

8. If $u_1 = 1$ and $u_n = \sqrt{3 + 2u_{n-1}}$ for $n \geq 2$

(a) show that $u_n < 3$ for $n \geq 1$,

(b) deduce that $u_{n+1} > u_n$ for $n \geq 1$.