2)

a. $\lim_{n\to\infty} \frac{(n+1)^5}{n^5} = \lim_{n\to\infty} \left(\frac{(n+1)}{n}\right)^5 = (by\ L'Hopitals\ Rule) \lim_{n\to\infty} 5 * \left(\frac{1}{1}\right) = 5$

Therefore $(n+1)^5 is\ O(n^5)$

b. $\lim_{n\to\infty} \frac{2^{n+1}}{2^n} = \lim_{n\to\infty} \frac{2^1}{2^0} = 2$

Therefore 2^{n+1} is $O(2\char`^n)$

c. $\lim_{n\to\infty} \frac{n}{n\,log\ n} = \lim_{n\to\infty} \frac{1}{\log n} = \frac{1}{\infty}$

Therefore $n\ is\ O(n \log n)$

d. $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} = \frac{(n^2+n)(2n+1)}{6} = \frac{2n^3+3n^2+n}{6}$

$$\lim_{n\to\infty} \frac{2n^3 + 3n^2 + n}{6n^3} = \frac{1}{3}$$

Therefore $\sum_{i=1}^{n} i^2\ \ is\ O(n^3)$

e. $\lim_{n\to\infty} \frac{7n^2+5n+3}{n} = (by\ L'Hopitals\ Rule) \lim_{n\to\infty} \frac{14n+5}{1} = \infty$

Therefore $7n^2 + 5n + 3\ is\ not\ O(n)$