

$$\text{a) } \lim_{n \rightarrow \infty} \frac{2n^3+3n+5}{-3n^3+4n+7}$$

$$\lim_{n \rightarrow \infty} \frac{2n^3+3n+5}{-3n^3+4n+7}$$

$$\lim_{n \rightarrow \infty} \frac{\pi^3(2+\frac{3}{n^2}+\frac{5}{n^3})}{\pi^3(-3+\frac{4}{n^2}+\frac{7}{n^3})}$$

$$\lim_{n \rightarrow \infty} \frac{2+\frac{3}{n^2}+\frac{5}{n^3}}{-3+\frac{4}{n^2}+\frac{7}{n^3}}$$

$$\lim_{n \rightarrow \infty} \frac{2+3\frac{1}{n}\frac{1}{n}+5\frac{1}{n}\frac{1}{n}\frac{1}{n}}{-3+4\frac{1}{n}\frac{1}{n}+7\frac{1}{n}\frac{1}{n}\frac{1}{n}}$$

$$\frac{1}{n} \rightarrow 0 \implies \lim_{n \rightarrow \infty} \frac{2+3 \times 0+5 \times 0}{-3+4 \times 0+7 \times 0}$$

$$\implies \lim_{n \rightarrow \infty} \frac{2n^3+3n+5}{-3n^3+4n+7} = \frac{-2}{3}$$

$$\text{6) } \lim_{n \rightarrow \infty} \frac{3n^4+4^n n^2+(-3)^n}{2n^3+5^n}$$

$$\text{B) } \lim_{n \rightarrow \infty} \frac{n}{\sqrt{n^4+3n^2+4}-\sqrt{n^4-n^3+1}}$$

$$\lim_{n \rightarrow \infty} \frac{n}{\sqrt{n^4+3n^2+4}-\sqrt{n^4-n^3+1}}$$

$$\lim_{n \rightarrow \infty} \frac{n}{\sqrt{n^4+3n^2+4}-\sqrt{n^4-n^3+1}} \frac{\sqrt{n^4+3n^2+4}+\sqrt{n^4-n^3+1}}{\sqrt{n^4+3n^2+4}+\sqrt{n^4-n^3+1}}$$

$$\lim_{n \rightarrow \infty} \frac{n(\sqrt{n^4+3n^2+4}+\sqrt{n^4-n^3+1})}{(\sqrt{n^4+3n^2+4})^2-(\sqrt{n^4-n^3+1})^2}$$

$$\lim_{n \rightarrow \infty} \frac{n\sqrt{n^4}(\sqrt{1+\frac{3}{n^2}+\frac{4}{n^4}}+\sqrt{1-\frac{1}{n}+\frac{1}{n^4}})}{(n^4+3n^2+4)-(n^4-n^3+1)}$$

$$\lim_{n \rightarrow \infty} \frac{n^3(\sqrt{1+\frac{3}{n^2}+\frac{4}{n^4}}+\sqrt{1-\frac{1}{n}+\frac{1}{n^4}})}{n^3+3n^2+3}$$

$$\lim_{n \rightarrow \infty} \frac{\pi^3(\sqrt{1+\frac{3}{n^2}+\frac{4}{n^4}}+\sqrt{1-\frac{1}{n}+\frac{1}{n^4}})}{\pi^3(1+\frac{3}{n}+\frac{3}{n^3})}$$

$$\lim_{n \rightarrow \infty} \frac{\sqrt{1+3\frac{1}{n}\frac{1}{n}+4\frac{1}{n}\frac{1}{n}\frac{1}{n}+\sqrt{1-\frac{1}{n}+\frac{1}{n}\frac{1}{n}\frac{1}{n}}}}{1+3\frac{1}{n}+3\frac{1}{n}\frac{1}{n}\frac{1}{n}}$$

$$\frac{1}{n} \rightarrow 0 \implies \lim_{n \rightarrow \infty} \frac{\sqrt{1+3 \times 0+4 \times 0}+\sqrt{1-0+0}}{1+3 \times 0+3 \times 0}$$

$$\implies \lim_{n \rightarrow \infty} \frac{n}{\sqrt{n^4+3n^2+4}-\sqrt{n^4-n^3+1}} = 2$$

$$\text{e) } \lim_{n \rightarrow \infty} \frac{(2n)!!}{(2n)^n}$$

$$\lim_{n \rightarrow \infty} \frac{(2n)!!}{(2n)^n}$$

$$\lim_{n \rightarrow \infty} \frac{2\pi(n!)}{2\pi(2n)^{n-1}}$$

$$\lim_{n\rightarrow\infty}\frac{\prod_{k=1}^nk}{\prod_{i=1}^{n-1}2n}$$

$$\prod_{k=1}^nk\prec\prod_{i=1}^{n-1}2n\implies\lim_{n\rightarrow\infty}\frac{(2n)!!}{(2n)^n}=0$$