

Answer to question # 50055

**Given:**

$$\frac{(n+1)\sqrt{1+(n+1)^2}(n+3)}{n(n+2)\sqrt{1+n^2}}$$

**Solution:**

$$1) \lim_{n \rightarrow \infty} \frac{(n+1)\sqrt{1+(n+1)^2}(n+3)}{n(n+2)\sqrt{1+n^2}} = \lim_{n \rightarrow \infty} \sqrt{\frac{[(n+1)(n+3)]^2(1+n^2+2n+1)}{[n(n+2)]^2(n^2+1)}} =$$

$$= \lim_{n \rightarrow \infty} \sqrt{\frac{(n^2+4n+3)^2(n^2+2n+2)}{(n^2+2n)^2(n^2+1)}} = \lim_{n \rightarrow \infty} \sqrt{\frac{n^6 + \dots}{n^6 + \dots}} = 1$$

$$2) \lim_{n \rightarrow 0} \frac{(n+1)\sqrt{1+(n+1)^2}(n+3)}{n(n+2)\sqrt{1+n^2}} = \frac{3\sqrt{2}}{0} = \infty$$

**Answer:**

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

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