MATH 2132 Tutorial 1

In Problems 1–10, evaluate the limit if it exists.

1. $\lim\limits_{n\to\infty} \dfrac{n+2}{3n^2+5}$

2. $\lim\limits_{n\to\infty} (-1)^n \left(\dfrac{n+2}{3n^2+5}\right)$

3. $\lim\limits_{n\to\infty} \dfrac{n^2+2}{3n^2+5}$

4. $\lim\limits_{n\to\infty} (-1)^n \left(\dfrac{n^2+2}{3n^2+5}\right)$

5. $\lim\limits_{n\to\infty} \dfrac{n^3+2}{3n^2+5}$

6. $\lim\limits_{n\to\infty} (-1)^n \left(\dfrac{n^3+2}{3n^2+5}\right)$

7. $\lim\limits_{n\to\infty} (\sqrt{n^2+3n-4} - \sqrt{n^2+6n+5})$

8. $\lim\limits_{n\to\infty} \left(1+\dfrac{3}{n}\right)^{2n}$

9. $\lim\limits_{n\to\infty} \left(\dfrac{3n+2}{2-n}\right) \mathrm{Cot}^{-1}\left(\dfrac{3-\sqrt{3}n^3}{2+3n+n^3}\right)$

10. $\lim\limits_{n\to\infty} \left(\dfrac{3}{n}\right)^{2n}$

11. $\lim\limits_{n\to\infty} \dfrac{\sin n}{n}$

12. $\lim\limits_{n\to\infty} \left[\mathrm{Tan}^{-1}(1/n)\right]^{1/n}$

13. Find the general term of the sequence

$$8, \quad \frac{11}{7}, \quad \frac{14}{25}, \quad \frac{17}{79}, \quad \dots .$$

14. Find the general term of the sequence

$$1, \quad -\frac{6}{5}, \quad \frac{12}{10}, \quad -\frac{20}{17}, \quad \frac{30}{26}, \quad \dots .$$

15. It can be proven that if $\lim\limits_{n\to\infty} c_n = C$ and $\lim\limits_{n\to\infty} d_n = D$, then $\lim\limits_{n\to\infty} c_n d_n = CD$. Use this to prove the following result: Suppose that $\lim\limits_{n\to\infty} c_n = C \neq 0$, and $c_n \neq 0$ for all n. Suppose further that $\lim\limits_{n\to\infty} d_n$ does not exist. Then $\lim\limits_{n\to\infty} c_n d_n$ does not exist.

Answers: **1.** 0 **2.** 0 **3.** 1/3 **4.** Does not exist **5.** ∞ **6.** Does not exist **7.** $-3/2$ **8.** e^6 **9.** $-5\pi/2$ **10.** 0 **11.** 0 **12.** 1 **13.** $(3n+5)/(3^n-2)$ **14.** $(-1)^{n+1}(n^2+n)/(n^2+1)$