BC Calculus Name_____Pd.____

Supplement: Sequences Infinite Series Day 1

Determine the limit of the sequence or state that the sequence diverges.

1. $a_n = 4$

$\lim_{n\to\infty} 4 = \boxed{4}$ converges

The limit of a constant is that constant.

2. $a_n = 5 - \frac{9}{n^2}$

$\lim_{n\to\infty} 5 - \frac{9}{n^2} = 5 - \frac{9}{\infty} = \boxed{5}$ converges

3. $c_n = -2^{-n}$

$\lim_{n\to\infty} -2^{-n} = \lim_{n\to\infty} -\frac{1}{2^n} = \frac{-1}{2^\infty} = \boxed{0}$

converges

4. $z_n = \left(\frac{1}{3}\right)^n$

$\lim_{n\to\infty} \left(\frac{1}{3}\right)^n = \lim_{n\to\infty} \frac{1^n}{3^n}$

$\lim_{n\to\infty} \frac{1}{3^n} = \frac{1}{3^\infty} = \boxed{0}$

Converges

5. $a_n = \frac{(-1)^n n^2 + n}{4n^2 + 1}$

n= even: $\lim_{n\to\infty} \frac{n^2+n}{4n^2+1} = \frac{1}{4}$

n= odd: $\lim_{n\to\infty} \frac{-n^2+n}{4n^2+1} = \frac{-1}{4}$

$\Big\rangle$ different

$\therefore$ diverges

6. $a_n = \frac{n}{\sqrt{n^3+1}}$

$\lim_{n\to\infty} \frac{n}{\sqrt{n^3+1}} = \boxed{0}$

Converges

BC Calculus Name_____ Pd.____

Supplement: Sequences Infinite Series Day 1

Determine the limit of the sequence or state that the sequence diverges.

7. $a_n = \cos(\pi n)$

n=even $\lim_{n\to\infty} \cos(\text{even}\pi) = 1$

n=odd $\lim_{n\to\infty} \cos(\text{odd}\pi) = -1$

different answers

∴ a_n diverges

8. $a_n = \frac{2n^2-4n+5}{3n^2+2}$

$\lim_{n\to\infty} \frac{2n^2-4n+5}{3n^2+2} = \boxed{\frac{2}{3}}$

converges

Determine if the sequence is increasing, decreasing, or not monotonic. Is the sequence bounded?

9. $a_n = \frac{1}{2n+1}$ $\lim_{n\to\infty} \frac{1}{2n+1} = 0$

n=1 n=2 n=3 n=4 n=5 ... n=∞

$\frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \frac{1}{9}, \frac{1}{11}, \ldots 0$

The function is decreasing & bounded from $[0, \frac{1}{3}]$

10. $a_n = \frac{3n^2}{n^2+2}$ $\lim_{n\to\infty} \frac{3n^2}{n^2+2} = 3$

n=1 n=2 n=3 n=4 ... n=∞

$\frac{3}{3}, \frac{12}{6}, \frac{27}{11}, \frac{48}{18} \ldots 3$

$1, 2, 2\frac{6}{11}, 2\frac{2}{3}, \ldots 3$

The function is increasing & bounded from $[1, 3]$