Reading Questions 1

Section 9.1 : Example 1

Section 9.1 : Example 2 $G_1, G_2, G_3, \ldots$

1. A term in a sequence is a number. in general false
2. The sequence $s_n = \frac{n(n+1)}{2}$ is an infinite list. $n=1 \Rightarrow 1, \quad n=2 \Rightarrow 3, \ldots$
3. The next term in the sequence $1, 2, 4, 8, 16, 32, \ldots$ is 64. T
4. What is the next term in the sequence $3, 6, 9, 12, \ldots$? 15

Section 9.1 Sequences (Part 1)

Worksheet 9.1

1) not a sequence b/c only 4 terms, no "..." not ∞ terms

Review of Sequences

P 1. A sequence is a special kind of list. Determine if the list $1, 1, 1, 1, 1$ is a sequen

sequence. What is the nth term of the sequen

$s_n = 2^{n-1}, \quad n \geq 1$

What does it mean for a sequence to be a recu

P 2. The nth term of a sequence can be used to name the sequence without listing the terms of the sequence. What is the nth term of the sequence $1, 2, 4, 8, 16, \ldots$?

P 3. What does it mean for a sequence to be a recursive sequence?

P 4. To determine the nth term of a sequence it is useful to know the first few terms of the sequence in order to find common sequence patterns. For the following sequence write the first six terms and the nth term of the sequence.

$$s_n = ns_{n-1} \quad \text{where} \quad n \geq 2 \text{ and } s_1 = 1.$$

Limits of Sequences

P 5. What does it mean for a sequence to have a limit?

> **Definition**
>
> If a sequence has a limit L then we say the sequence converges to L. Otherwise the sequence diverges.

P 6. Determine if the sequences converge or diverge. If the sequences converge find the limit. If the sequence diverges state how you came to that conclusion.

1. $s_n = \frac{n}{n^2+1}$
2. $a_n = \frac{n^3+2}{n^2+1}$
3. $b_n = n + \frac{1}{n}$
4. $c_n = (-1)^n + \frac{1}{n}$

P 7. Give a sequence that diverges which contains positive and negative terms. If the signs of the terms alternate then the sequence is called an alternating sequence.

9.1 Sequences

Def: A sequence is an infinite list of numbers.

Ex: The list $2, 4, 6, 8, \ldots$ is a sequence.

1st term (2), 2nd term (4)

Def: The nth term s_n (or general term) of a sequence is a formula for the nth position in the list.

Ex: The nth term of $2, 4, 8, 16, \ldots$ is $s_n = 2^n$

$n \geq 1$.

Def: A recursive sequence is a sequence whose nth term is recursive.

Ex: $s_n = (s_{n-1})^2$ is a recursive sequence where

$\underbrace{s_1 = 3}_{\text{initial condition}}$ and $n \geq 2$.

$s_1 = 3$, $s_2 = (s_{2-1})^2 = s_1^2 = 3^2 = 9$, $s_3 = 9^2$, $s_4 = (s_3)^2 = ((s_2)^2)^2 = (((s_1)^2)^2)^2 = s_1^8 = 3^8$

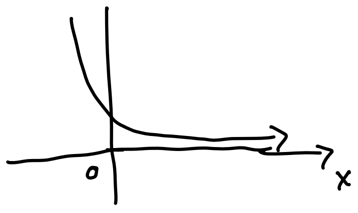
$3^1, 3^2, 3^4, 3^8, \ldots$

Review

Ex: Find the limit of the functions:

$f(x) = \frac{1}{x+2}$, $\lim_{x \to \infty} f(x) = \lim_{x \to \infty} \frac{1}{x+2}$

$= 0$



$x = 0 \Rightarrow f(x) = \frac{1}{0+2} = \frac{1}{2}$

$x = 1 \Rightarrow f(x) = \frac{1}{1+2} = \frac{1}{3}$

$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots \to 0$

$\lim_{x \to \infty} f(x) = \lim_{x \to \infty} \frac{1}{x} = 0$

let $g(x) = \frac{x}{x+2}$. Find $\lim_{x \to \infty} g(x) = \lim_{x \to \infty} \frac{x}{x+2}$

$= \lim_{x \to \infty} \frac{x}{x}$

$= \lim_{x \to \infty} 1 = 1$

$g(x) = \frac{k(x) \to \infty}{r(x) \to \infty}$

$\lim_{x \to \infty} g(x) = \lim_{x \to \infty} \frac{k'(x)}{r'(x)}$

$= \lim_{x \to \infty} \frac{1}{1} = 1$

P: Find $\lim_{x \to \infty} \frac{x^2}{x+2}$. $\frac{x^2}{x+2} \to \infty$

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