Consider the sequence $\left\{ \dfrac{5k^2 - 42}{3k^2 + 5} \right\}_{k=1}^{\infty}$. We want to know whether or not this sequence converges, and if so, what to.

Just to try to get a feel for what's going on with this sequence, let's look at the first several terms of this sequence.

k	a_k
1	$-\frac{37}{8}$
2	$-\frac{22}{17}$
3	$\frac{3}{32}$
4	$\frac{38}{53}$
5	$\frac{83}{80}$
6	$\frac{138}{113}$

Thus the sequence begins like

$$\{-\frac{37}{8}, -\frac{22}{17}, \frac{3}{32}, \frac{38}{53}, \frac{83}{80}, \frac{138}{113}, \ldots\}$$

Do the following sequences converge or diverge?
If the sequence converges, find the limit.

1. $\left\{ \dfrac{j^2 + 32j}{e^j} \right\}_{j=3}^{\infty}$

2. $\left\{ \dfrac{\sin(k)}{k^2} \right\}_{k=1}^{\infty}$

Example: $\sum_{k=0}^{\infty}\left(\frac{1}{2}\right)^k$ is a geometric series, with $r=\frac{1}{2}$.

The associated **sequence of terms** $\{a_k\}$ is

$$\left\{\left(\frac{1}{2}\right)^k\right\}_{k=0}^{\infty}=\{1,\frac{1}{2},\frac{1}{4},\frac{1}{8},\frac{1}{16},\dots\}$$

The associated **sequence of partial sums** S_n is

$$\begin{aligned}\{1,1+\frac{1}{2},1+\frac{1}{2}+\frac{1}{4},1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8},\\ 1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16},\dots\} \quad &= \quad \{1,\frac{3}{2},\frac{7}{4},\frac{15}{8},\frac{31}{16},\dots\}\end{aligned}$$

For each series below:

(a) What is a_2? a_3?

(a) What is S_2? S_3?

(c) Does the series converge or diverge? If it converges, find the value to which it converges.

1. $\displaystyle\sum_{k=0}^{\infty} \frac{4}{3^k}$

2. $\displaystyle\sum_{k=0}^{\infty} \frac{3^k}{(-4)^k}$