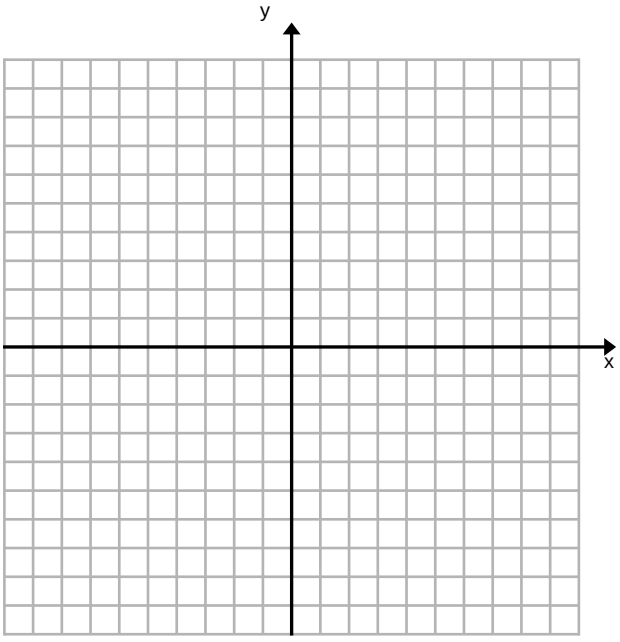
Going to Infinity

Warmup:

1. **Graph:** $f(x)=3$.

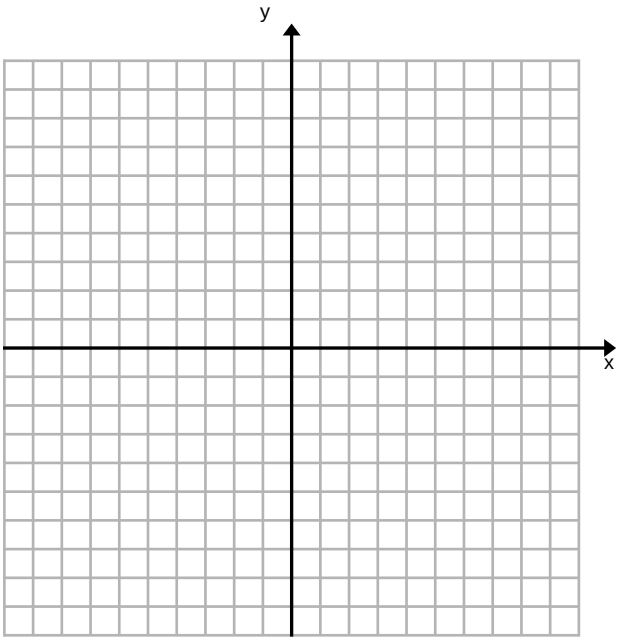


   a) **Find** $\lim_{x\to 4} f(x)$
   b) **Find** $\lim_{x\to 10} f(x)$
   c) **Find** $\lim_{x\to \infty} f(x)$

2. **Graph:** $f(x)=\frac{1}{x}$.

   a) **Find** $\lim_{x\to 4} f(x)$
   b) **Find** $\lim_{x\to 10} f(x)$
   c) **Find** $\lim_{x\to \infty} f(x)$

3. **Graph:** $f(x)=\frac{2}{x}$.



   a) **Find** $\lim_{x\to 4} f(x)$
   b) **Find** $\lim_{x\to 10} f(x)$
   c) **Find** $\lim_{x\to \infty} f(x)$

4. **Graph:** $f(x)=\frac{16}{x^2}$.

   a) **Find** $\lim_{x\to 4} f(x)$
   b) **Find** $\lim_{x\to 10} f(x)$
   c) **Find** $\lim_{x\to \infty} f(x)$

We can conclude:

$$\lim_{x\to\infty}\left(\frac{1}{r}\right)^x = \frac{1}{r^x} = 0,\ if\ r>1 \quad \textbf{AND} \quad \lim_{x\to\infty} r^x = 0,\ if\ |r|<1$$

Infinite Sequences

Definitions:

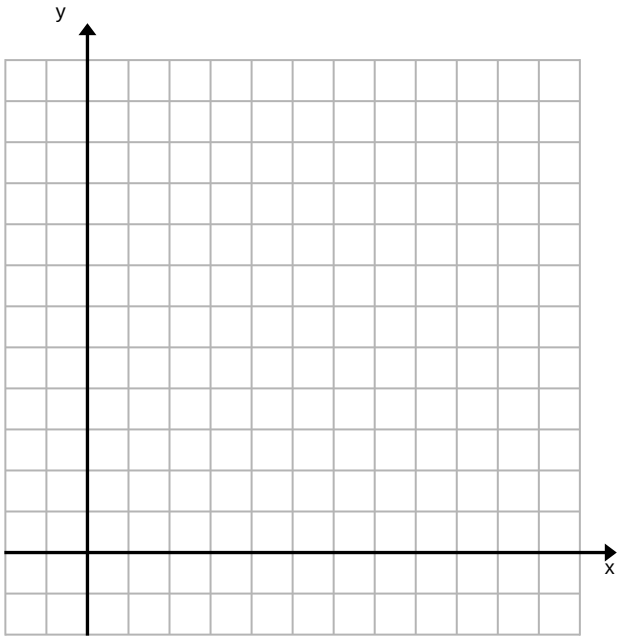
An infinite sequence is the range of a function which has the set of natural number as its domain. If the terms of an infinite sequence approach a unique finite value, that sequence is called a convergent sequence. A sequence which does not converge is called divergent.

OBJECTIVE – find the value of an infinite convergent sequence.

1. a) Determine the first five terms of the sequence defined by the function

$$t(n) = \frac{n}{n+1} \qquad n \in N$$

b) Plot the points of sequence.



c) What do you think $\lim_{n\to\infty} f(n)$ is? What is the math that can justify this?

As with functions, we can conclude:

$$\lim_{n\to\infty}\left(\frac{1}{r}\right)^n = \frac{1}{r^n} = 0, \text{ if } r > 1$$

2. Find $\lim_{n\to\infty}\frac{2n-3}{n}$

3. Find $\lim_{n\to\infty}\frac{n^2-n}{2n^2+1}$

4. Find the limit if they exist

a) $\lim_{n\to\infty}\frac{3n^2-5n+8}{2n^2+3n-7}$

b) $\lim_{n\to\infty}(-1)^n$

c) $\lim_{n\to\infty}\frac{6n^3+1}{3n^4-n}$

d) $\lim_{n\to\infty}\left(\frac{1}{2}\right)^n$

Extra Practice: Page 50 #1 – 6, 8