Section 3.1 Continued

LIMITS AT INFINITY: The limit of a function $f(x)$, as x approaches positive or negative infinity, written $\lim_{x\to\pm\infty} f(x)$, if it exists, is the value that $f(x)$ approaches as x becomes infinitely large in magnitude in either the positive or negative direction.

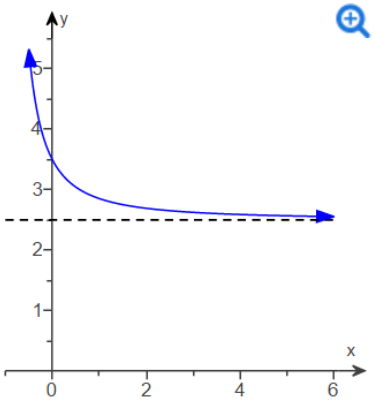
1. We have $\lim_{x\to\infty} \frac{1}{x^n} = 0$ whenever defined.

2. Similarly, $\lim_{x\to-\infty} \frac{1}{x^n} = 0$ whenever defined.

Essentially, one can think of a limit at infinity as a *horizontal asymptote*.

Examples:

1. The graph of a function $f(x)$ is pictured below. Find the limit $\lim_{x\to\infty} f(x)$.



2. Find $\lim_{x\to\infty} \frac{2x^2+5x-4}{x^2-3}$

3. The cost of manufacturing a particular videotape is $C(x) = 9000 + 5x$, where x is the number of tapes produced. The average cost per tape, denoted by $\overline{C}(x)$, is given by the formula

$$\overline{C}(x) = \frac{C(x)}{x}.$$

Find $\lim_{x \to \infty} \overline{C}(x)$.