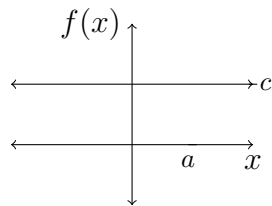


**Objectives:**

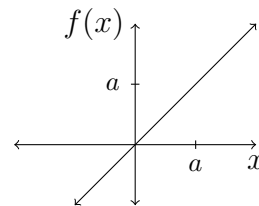
- Define some nice properties of limits (the “Limit Laws”)
- Use limit laws to compute more complicated limits

**Limits we know:** (These are listed in your textbook as limit laws 7 and 8.)



$$\lim_{x \rightarrow a} c =$$

*E.G.*  $\lim_{x \rightarrow 3} 7 =$



$$\lim_{x \rightarrow a} x =$$

*E.G.*  $\lim_{x \rightarrow 4} x =$

**Basic Limit Laws**

If  $\lim_{x \rightarrow a} f(x)$  and  $\lim_{x \rightarrow a} g(x)$  both exist:

1.  $\lim_{x \rightarrow a} (f(x) + g(x)) =$
2.  $\lim_{x \rightarrow a} (f(x) - g(x)) =$
3. For any constant  $c$ ,  $\lim_{x \rightarrow a} (cf(x)) =$
4.  $\lim_{x \rightarrow a} (f(x)g(x)) =$
5.  $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} =$  ONLY IF

**Some Limit Law Examples**

1.  $\lim_{x \rightarrow 2} (x + 4)$
2.  $\lim_{h \rightarrow 100} (300 - h)$
3.  $\lim_{t \rightarrow 3} (7t)$
4.  $\lim_{x \rightarrow 0} (x^2)$
5.  $\lim_{x \rightarrow 6} \frac{3}{x}$

**Building the Rest of the Limit Laws**

6. For every positive integer  $n$ ,  $\lim_{x \rightarrow a} (f(x))^n =$

7. For every positive integer  $n$ ,  $\lim_{x \rightarrow a} x^n =$

8. For every positive integer  $n$ ,  $\lim_{x \rightarrow a} \sqrt[n]{x} =$

9. For every positive integer  $n$ ,  $\lim_{x \rightarrow a} \sqrt[n]{f(x)} =$

**Examples Involving Several Limit Laws**

(a) Find  $\lim_{x \rightarrow 1} 5x^{10} - 7x^3 - 8$ .

(b) Find  $\lim_{x \rightarrow 3} \frac{2x^3 - 1}{x^2 + 6x}$ .

**Conclusion:** If  $f(x)$  is a \_\_\_\_\_ function,

and  $f(a)$  is \_\_\_\_\_, then  $\lim_{x \rightarrow a} f(x) =$  \_\_\_\_\_.

We say that these functions have the \_\_\_\_\_.

**Example**  $\lim_{t \rightarrow 2} \frac{t^3 - t + 1}{t + 1}$

**Example**  $\lim_{t \rightarrow -1} \frac{t^3 - t + 1}{t + 1}$