The method listed below can be used to find the limits for almost any function.

The first two steps should be:
1. determine the type of function in the problem
and
2. determine if the limit is being evaluated at a number or at $\pm \infty$.

### Table: Type of Function

<table>
<thead>
<tr>
<th>Polynomial</th>
<th>Rational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find the limit of each term individually by &quot;plugging in&quot; the value for $a$ for each $x$.</td>
<td>Find the limit of both the numerator and the denominator separately.</td>
</tr>
<tr>
<td>$\lim_{x \to a} x^3 - 7x - 6 \rightarrow \lim_{x \to \frac{3}{2}} x^3 - \lim_{x \to \frac{3}{2}} 7x - \lim_{x \to \frac{3}{2}} 6 = \frac{27}{8} + \frac{21}{2} - 6 = \frac{9}{8} = 1.125$</td>
<td>[ \lim_{x \to \frac{3}{2}} \frac{x^3 - 7x - 6}{x^2 - 9} \rightarrow \lim_{x \to \frac{3}{2}} \frac{3^3 - 7\left(\frac{3}{2}\right) - 6}{3^2 - 9} = \frac{0}{0} ] So let's factor…</td>
</tr>
<tr>
<td>[ \lim_{x \to \frac{3}{2}} \frac{x^3 - 7x - 6}{x^2 - 9} \rightarrow \lim_{x \to \frac{3}{2}} \frac{(x - 3)(x + 1)(x + 2)}{(x - 3)(x + 3)} \rightarrow \lim_{x \to \frac{3}{2}} \frac{(x + 1)(x + 2)}{(x + 3)} = \frac{20}{6} = \frac{10}{3} ]</td>
<td>See also Ch. 2.2 p. 130 in Calculus by Anton</td>
</tr>
</tbody>
</table>

See also Ch. 2.2 p. 132 in Calculus by Anton
A polynomial behaves like its term of highest degree at \( x \to \pm \infty \).

Therefore, you only have to examine the leading term's behavior at \( \infty \). Disregard other terms.

\[
\lim_{x \to \infty} x^3 - 7x - 6 = \lim_{x \to \infty} x^3 = -\infty
\]

Since a rational function is made of polynomials, the ratio of the leading terms in the numerator and denominator will dictate the behavior at \( x \to \pm \infty \).

Ex. 1 \[ \lim_{x \to \infty} \frac{x^3 - 7x - 6}{x^2 - 9} = \lim_{x \to \infty} \frac{x^3}{x^2} = \lim_{x \to \infty} x = +\infty \]

Ex. 2 \[ \lim_{x \to \infty} \frac{x^2 - 9}{x^3 - 7x - 6} = \lim_{x \to \infty} \frac{x^2}{x^3} = \lim_{x \to \infty} \frac{1}{x} = 0 \]