How do we calculate limits at infinity? Well, three things.

1) The Limit Laws and the Squeeze Theorem remain valid for limits at infinity. The usual restriction applies: For the limit of a quotient to be expressible as the quotient of the limits, the denominator needs to be nonzero. We need to add in another type of condition. I mentioned before that ∞ and $-\infty$ are not real numbers.They do not denote anything on the real number line. Rather they are symbols to help us express the idea that a variable, say x; is taking on indefinitely large (or large negative) values. Thus we should not be using it, at least at this level, for arithmetical calculations. There is nothing called ∞/∞ for example. So, we will not say the limit of a quotient is the quotient of the limits in case the limit of the top or that of the bottom happens to be $\pm\infty$. This, however, does not mean that we can't say anything about limits of the structures in which some components involve $\pm\infty$. (More on this later)

2) Besides the obvious limit $\lim_{x\to\infty} k = \lim_{x\to\infty} k = k$ for any constant k, we have another basic limit fact (i.e., basic building block):

$$\lim_{x\to\infty} \frac{1}{x^p} = 0 \text{ and } \lim_{x\to-\infty} \frac{1}{x^p} = 0$$

for all positive powers p and $\frac{1}{x^p}$ allows us to talk about the limit. What does this last sentence "the domain of $\frac{1}{x^p}$ allows us to talk about the limit" mean? Well, let $p = 1/2$ and consider $\lim_{x\to-\infty} \frac{1}{x^{1/2}}$. Even discussing such a limit is absurd because for negative values of x, $\sqrt{x}$ is not defined so we cannot talk about a limit, because $\frac{1}{x^{1/2}}$ is not a function. So the above limit facts are true only if it makes mathematical sense to talk about it.

3) A third basic limit you will need is the polynomials: For any $k > 0$

$$\lim_{x\to\infty} x^k = \infty \text{ and } \lim_{x\to-\infty} x^k = \begin{cases} +\infty & \text{if k is even} \\ -\infty & \text{if k is odd} \end{cases}$$