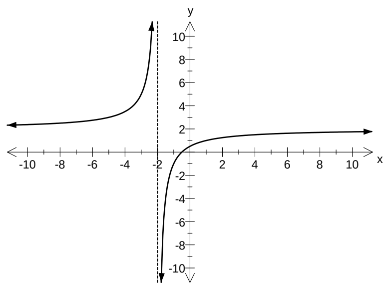
AP Calculus

3.5 – Asymptotic Behaviour & Limits AT Infinity

If $\lim_{x\to a} f(x) = \pm\infty$ then the graph of $f(x)$ has ____.

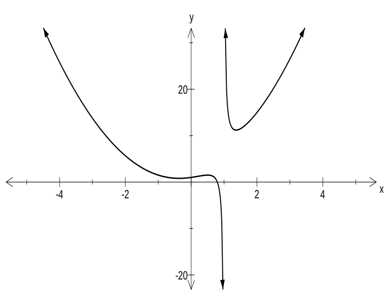
→ Limit ___ infinity gives the behaviour of f as x approaches ____.

If $\lim_{x\to\pm\infty} f(x) = L$ → Limit ___ infinity → As x approaches ____, f as approaches _________.



$\lim_{x\to -2} \frac{2x+1}{x+2} =$

$\lim_{x\to -\infty} \frac{2x+1}{x+2} =$



$\lim_{x\to 1} \frac{2x^3-1}{x-1} =$

$\lim_{x\to \infty} \frac{2x^3-1}{x-1} =$

NOTE: Let, $\lim_{x\to\pm\infty} f(x) = L$. If

$L = +\infty$ then f is ________________ without bound for very large x.

$L = -\infty$ then f is ________________ without bound for very large x.

$L = \Re$ then f is __________________________________ as x gets large.

→ ___________________ _____________________

How to find limits AT infinity, algebraically.

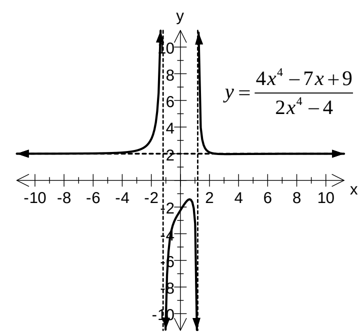
Step I Re-write $f(x)$ as an equivalent form by dividing numerator and denominator by highest power of x.

Step II Use the facts: $\lim_{x\to\pm\infty} \frac{\Re}{x} = 0$ and $\frac{\pm\Re}{0} = \pm\infty$ to determine the value of each term in the expression.

1. $\lim\limits_{x \to \infty} \dfrac{2x^3 - 1}{x - 1} =$

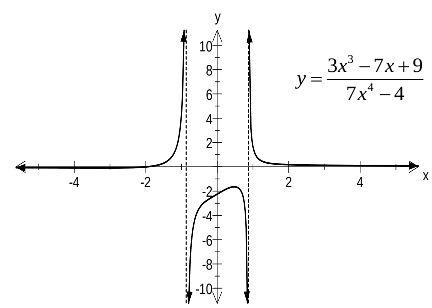
2. $\lim\limits_{x \to -\infty} \dfrac{2x + 1}{x + 2} =$

3. a) $\lim\limits_{x \to \infty} \dfrac{4x^4 - 7x + 9}{2x^4 - 4} =$



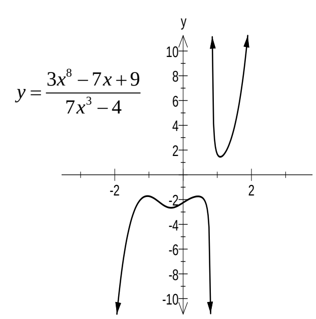
b) $\lim\limits_{x \to -\infty} \dfrac{4x^4 - 7x + 9}{2x^4 - 4} =$

4. a) $\lim\limits_{x \to \infty} \dfrac{3x^3 - 7x + 9}{7x^4 - 4} =$



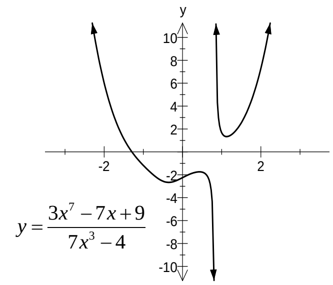
b) $\lim\limits_{x \to -\infty} \dfrac{3x^3 - 7x + 9}{7x^4 - 4} =$

5. a) $\lim\limits_{x \to \infty} \dfrac{3x^8 - 7x + 9}{7x^3 - 4} =$



b) $\lim\limits_{x \to -\infty} \dfrac{3x^8 - 7x + 9}{7x^3 - 4} =$

6. a) $\lim_{x\to\infty}\dfrac{3x^7-7x+9}{7x^3-4}=$



b) $\lim_{x\to-\infty}\dfrac{3x^7-7x+9}{7x^3-4}=$

7. $\lim_{x\to\infty}\dfrac{3x^{\frac{5}{2}}+7x^{-\frac{1}{2}}}{x-x^{\frac{1}{2}}}=$

8. $\lim_{x\to\infty}\dfrac{x^2}{\sqrt{x^3+1}}=$