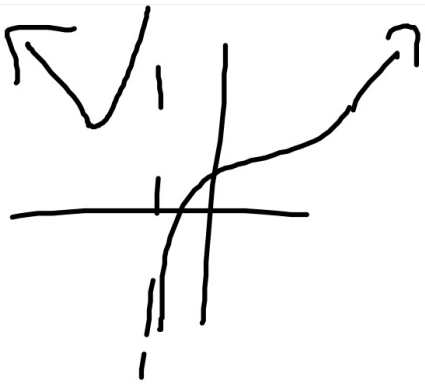
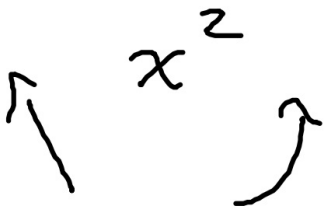
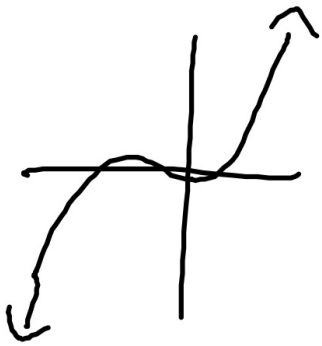
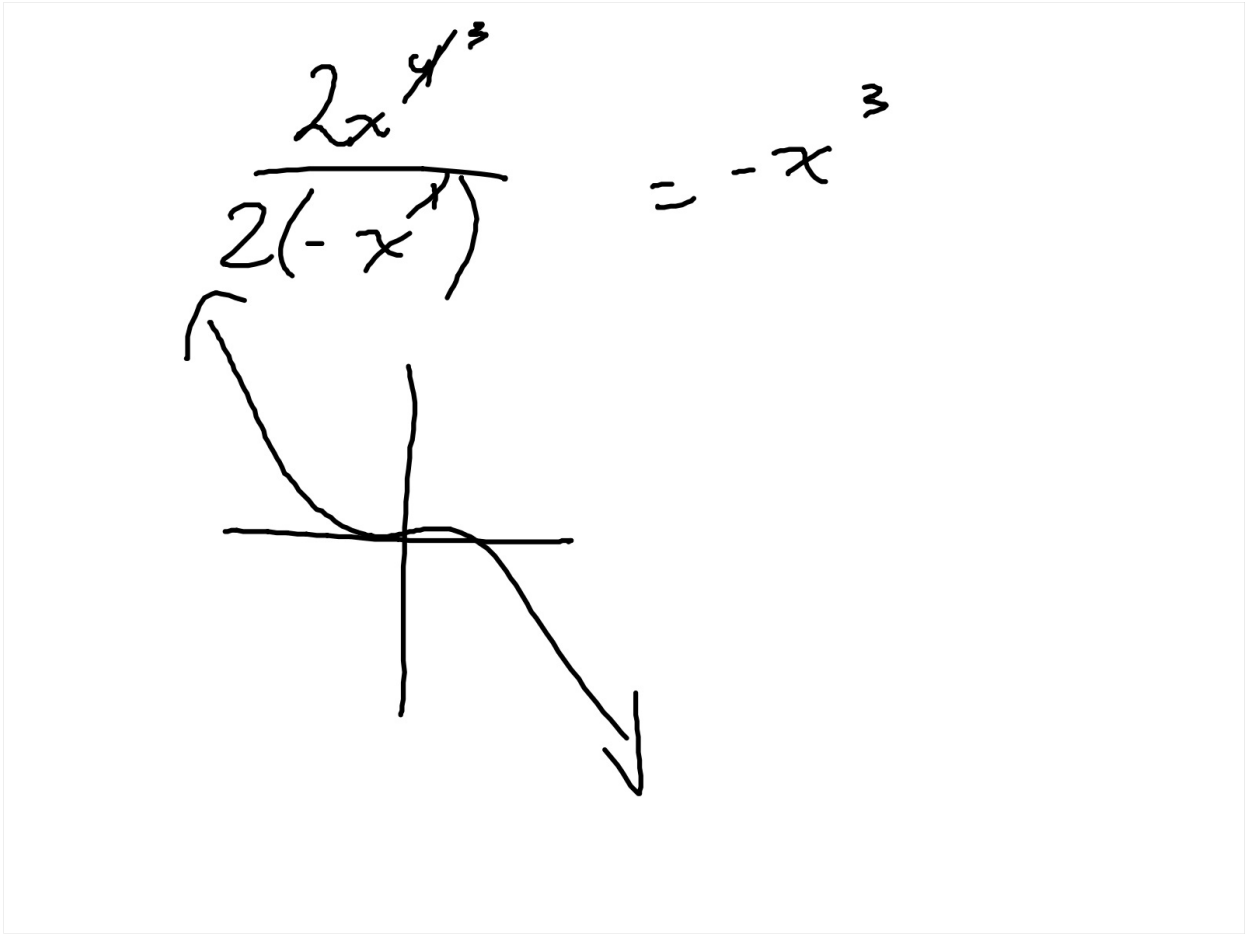
$$\lim_{x \to \infty} \frac{2x^3 - 3x^2 + 1}{x^2 + 3}$$





$$\frac{x^6}{2x^2} = x^3$$





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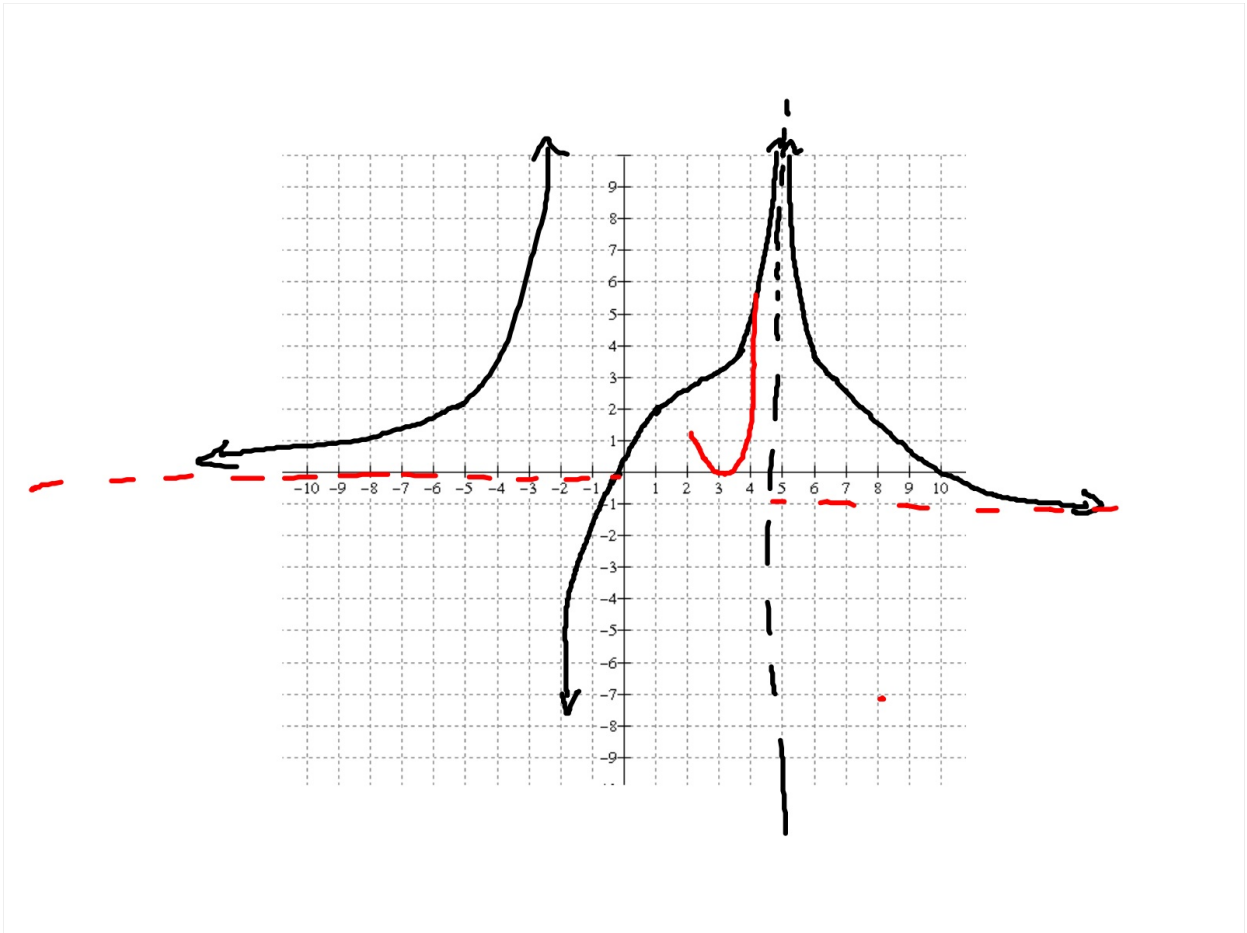

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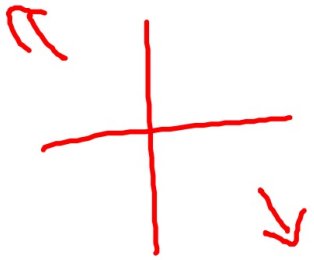
L-7 End Behavior

Polynomial functions: compare the largest exponent in the numerator and denominator, simplify and follow the end behavior rules for polynomial functions.

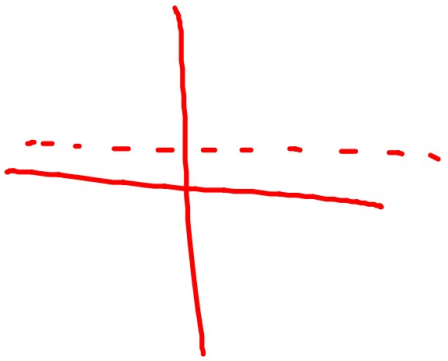
Ex $f(x) = \dfrac{-6x^6 + \cdots + 2}{3 + \cdots + 4x^3}$ Case 1

$= \dfrac{-6x^3x^3}{4x^3} = -x^3$ ← polynomial end behavior



Case 2 $f(x) = \dfrac{3x^2 + 6x - 2}{4x^2 - 7x + 1}$

$= \dfrac{3x^2}{4x^2} = \dfrac{3}{4}$

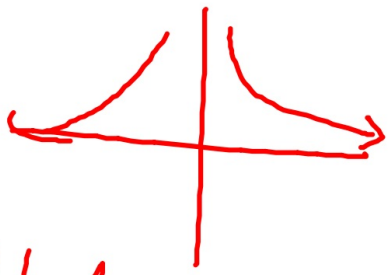


H.A at greatest coefficient

Case 3 $f(x) = \frac{2x^3 + \cdots + 3}{7x^5 + \cdots + 1}$

$(2x^3)/(7x^5) = \frac{2x^3}{7x^5}$ -

$(2 \cdot x^3) \div (7 \cdot x^5)$



H.A. at 0

As $x \to \infty$

no growth

i) $\sin x$ ~~A/A~~ $[-1, 1]$

ii) $\ln x$ slow growth

power iii) x^n x^0 x^2 x^3 x^4 $\vdots$ x^{100} fast $\vdots$ faster

exponential iii) e^x fastest

Ex 1 $\lim_{x\to\infty} \frac{e^x}{x^2} = \frac{\text{fastest}}{\text{fast}} = \infty$

$\lim_{x\to\infty} \frac{(-e^x)}{x^2} = -\infty$

$f(x) = \frac{x}{\sqrt{x^2+1}} = \frac{x}{x}$

$\lim_{x\to+\infty} f(x) = 1$

$\lim_{x\to-\infty} f(x) = -1$