Growth

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Publisher : Math Everywhere, Inc. **Distributor & Translator**: MathMonkeys, LLC

1.01 Growth

Give It a Try G2

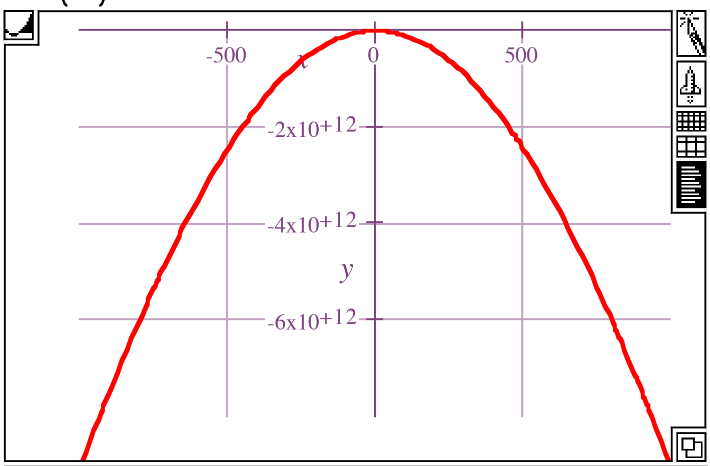
Graphics Primitives

G.2) Global scale*

G.2.a)

Look at:

$f(x) = x^4 - 10000000\,x^2$



– 1000 ... 1000 = left...right Stretch to Fit
– 8000000000000 ... 0 = bottom...top cropping Moderately

Graph Building Blocks

Curve at $(x, f[x])$ where x = left ... right with a heavy line, colored Red.

Is this a good global scale plot of

$f(x) = x^4 - 10000000\,x^2$?

Why or why not?

If it is not a good global scale plot of $f(x)$, then give a good global scale plot of $f(x)$.

The dominant term is x^4 but the plot shows us -c*x^2 parabola for some constant c. We know that x^4 is always positive but the plot if always negative. For both reasons it is not a good reprasentative plot.

?

We need to find the roots for the equation to get a idea of what interval to use for the plot.

$f(x) = x^4 - 10000000\,x^2$

$f(x) = (x^2 - 128\cdot 5^7)\,x^2$ *Collect*

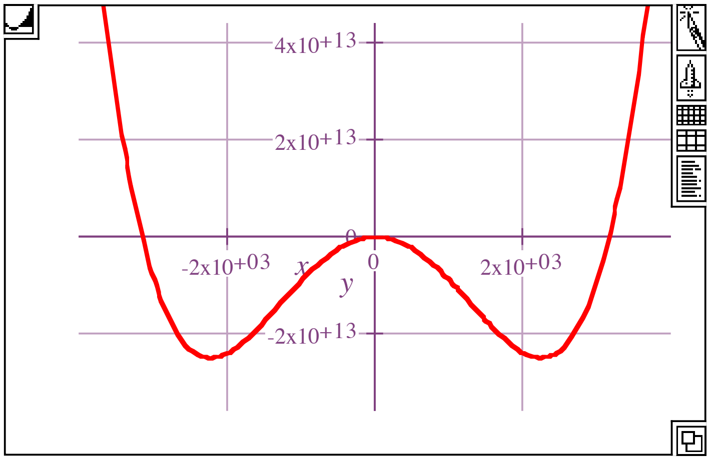
$x^2 - 128 \cdot 5^7 = 0$

$x = \left(0 + 128 \cdot 5^7\right)^{\frac{1}{2}}$ *Isolate*

$x = 3162.27766016838$ *Calculate*

So we will choose about -4000 to 4000, I added a order of magnitutde to the range interval ot see the critical points and behavior to the left and right of the roots.

RC: 09/03/12: Good



G.2.b)

Put

$$f(x) = \frac{2\,x^6 + 50\,x^2}{x^6 + 3\,x^2 + 1}.$$

What do you say are the limiting values

$$\lim_{x \to \infty} f(x)$$

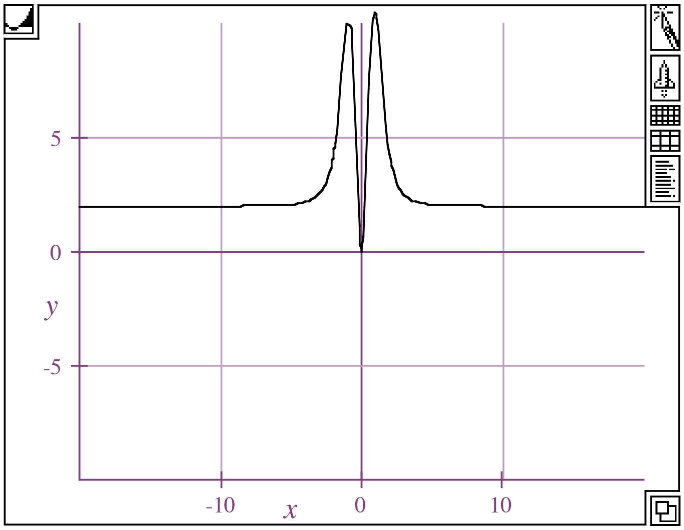
and

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

The global scale behavior of both numerator and denominator is x^6, so we have both limits are 0.

RC: 09/03/12: Incorrect. Your graph is showing a different limit, between 0 and 5. What it is? How about a dominant term analysis?

$$f(x) = \frac{2x^6 + 50x^2}{x^6 + 3x^2 + 1}$$



G.2.c)

What do you say is the limiting value

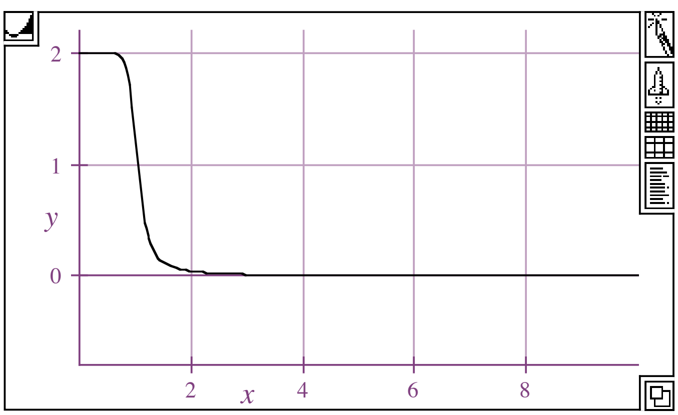
$$\lim_{x \to \infty} \frac{x^9 + 4e^{0.6x}}{3x^{12} + 2e^{0.6x}}?$$

Illustrate with a plot.

The global scale of the numerator is dominated by e ^0.6x . The gloval scale of the denominator is also e ^0.6x (exponential terms dominate power terms). So we have both cancel and the limit is equal to zero.

RC: 09/03/12: Incorrect reasoning Your graph will show a different limit if you go out to the right far enough - around x=200 or so. What it is? How about a dominant term analysis?

$$f(x) = \frac{x^9 + 4e^{0.6x}}{3x^{12} + 2e^{0.6x}}$$



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