1.01 Growth

Give It a Try G2

Growth Primitives

G.2) Global scale*

G.2.a)

Look at:

\[ f(x) = x^4 - 10000000 x^2 \]

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 representative plot.

We need to find the roots for the equation to get a idea of what interval to use for the plot.
It was previously stated that 
\[ \Delta x = (0 + 128.57)^{\frac{1}{2}} \]
Isolate \( \Delta x = 3162.27766016838 \)
Calculate

So we will choose about -4000 to 4000, I added a order of magnitude 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

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

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 dominant term analysis?

\[ f(x) = \frac{2x^6 + 50x^2}{x^6 + 3x^2 + 1} \]
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 global 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 is it? How about a dominant term analysis?

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