Limits and Continuity 3 – Limits at infinity, Horizontal Asymptotes, and Dominance

Limit as *x* approaches infinity

$$\lim_{x\to\infty} e^{-x} =$$

$$\lim_{x\to\infty}\left(1-\frac{1}{3^x}\right) =$$

$$\lim_{x\to\infty}\left(1-3^x\right) =$$

$$\lim_{x\to-\infty}\left(1-\frac{1}{3^x}\right) =$$

$$\lim_{x\to-\infty}\left(1-\frac{1}{3^x}\right) =$$

Dominance

$$\lim_{x\to\infty}\frac{4x^3-5x^2+4x-7}{x^2-1} =$$

$$\lim_{x\to\infty}\frac{4x^3-5x^2+4x-7}{x^3-1} =$$

$$\lim_{x\to\infty}\frac{4x^3-5x^2+4x-7}{x^4-1} =$$

$$\lim_{x\to\infty}\frac{e^x}{x^5} =$$

$$\lim_{x\to\infty}\frac{x^5}{e^x} =$$

$$\lim_{x\to\infty}\frac{\ln\left(x^5\right)}{x^{0.02}} =$$

How many times do the graphs of $y = x^4$ and $y = e^x$ intersect?

Horizontal Asymptotes

$$y = 2^{-x}\sin(x)$$

Slant Asymptotes

$$\lim_{x\to\infty}\frac{x^3 - x^2 + 2x - 4}{x^2 + 1} = \lim_{x\to\infty}\left(x - 1 + \frac{x-3}{x^2-1}\right) =$$

1998

2. Let f be the function given by $f(x) = 2xe^{2x}$.
   (a) Find $\lim_{x\to-\infty} f(x)$ and $\lim_{x\to\infty} f(x)$.
   (b) Find the absolute minimum value of f. Justify that your answer is an absolute minimum.
   (c) What is the range of f?
   (d) Consider the family of functions defined by $y = bxe^{bx}$, where b is a nonzero constant. Show that the absolute minimum value of bxe^{bx} is the same for all nonzero values of b.