Your Name:

ID #:

Worksheet: Limits to Infinity

Note: for all the problems, identify the limit as a number, $-\infty$, ∞ or DNE (does not exist)

1. Please keep in mind the list of functions in order of their rate of growth – quickest to slowest:

   Factorial(x!), **Exponential** (4^x, e^x), **Algebraic** (x^4, $x^{0.5}$), **Logarithm** ($log_2 x$, lnx)

   Then find the following limits quickly without showing any work:

   (a) $\lim_{x\to\infty} \frac{x^3}{x!} =$

   (b) $\lim_{x\to\infty} \frac{\sqrt[3]{x^4+2x^3+1}}{lnx+3} =$

   (c) $\lim_{x\to\infty} \frac{x^{10}+4x^7+10}{32x^{12}+10} =$

   (d) $\lim_{x\to\infty} \frac{5x+1}{x^2-3x+4}$

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

   (f) $\lim_{x\to\infty} \frac{2^x}{x^2}$

   (g) $\lim_{n\to\infty} \frac{5^n+2}{n^9+100} =$

   (h) $\lim_{n\to\infty} \frac{n^4+10lnn}{4\sqrt{n^8+3n+100}} =$

   (i) $\lim_{n\to\infty} \frac{-n^4+3n^2}{19n^3+3n^2-10} =$

   (j) $\lim_{x\to-\infty} \frac{x^{120}+20}{-x^{100}+e^x} =$

   (k) $\lim_{n\to-\infty} \frac{5^n+n^2}{-e^n+1} =$

   (l) $\lim_{x\to-\infty} \frac{2x^3-2x+5}{13x^3-5x+13} =$

   (m) $\lim_{x\to\infty} \frac{x^8+lnx}{3x^8+2} =$

   (n) $\lim_{x\to\infty} \frac{x^{10}+2x^2+10}{32x^6+12} =$

   (o) $\lim_{n\to\infty} \frac{n^5-10n^7+lnn}{n^3+8n^7} =$

   (p) $\lim_{x\to\infty} \frac{e^x}{x^3}$

   (q) $\lim_{x\to-\infty}(-3x^3-4x+5)$

   (r) $\lim_{n\to\infty} \frac{n^5-10n^7+lnn}{n^3+8n^7} =$

2. Practice some common limits without showing the work:

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

   (b) $\lim_{x\to 0} e^x =$

   (c) $\lim_{x\to-\infty} xlnx$

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

   (e) $\lim_{x\to 0+} e^{\frac{1}{x}} =$

   (f) $\lim_{x\to 0-} e^{\frac{1}{x}} =$

   (g) $\lim_{x\to-\infty} e^{\frac{1}{x}} =$

   (h) $\lim_{x\to\infty} e^{\frac{1}{x}} =$

   (i) $\lim_{x\to\infty} \frac{1}{e^{-x}} =$

3. Practice more common limits without showing the work:

(a) $\lim_{x\to\infty} lnx =$

(b) $\lim_{x\to 0^+} lnx =$

(c) $\lim_{x\to-\infty}(e^{3x} - e^{2x}) =$

(d) $\lim_{x\to\infty} \sin(\frac{x^2}{2x^2+x}) =$

(e) $\lim_{x\to\infty} \sin x =$

(f) $\lim_{x\to\infty}(\sin x)e^{-x} =$

(g) $\lim_{x\to\infty} x \sin x =$

(h) $\lim_{x\to\infty} \frac{1}{x} \sin x =$

(i) $\lim_{x\to\infty} \sin(\frac{1}{x}) =$

(j) $\lim_{x\to\infty} x \ln \frac{1}{x} =$

(k) $\lim_{x\to-\infty} xe^{\frac{1}{x}} =$

(l) $\lim_{x\to 0^-} xe^{\frac{1}{x}} =$

4. Show all you work for the following questions (limits at discontinuity and infinity)

(a) $\lim_{x\to 0} \frac{sin(3x)}{4x}$

(b) $\lim_{x\to\infty} x^{\frac{1}{x}}$

(c) $\lim_{x\to\infty}(\frac{1}{x})^{\frac{1}{x}}$

(d) $\lim_{x\to 1} \frac{5x^4-4x^2-1}{10-x-9x^3}$

(e) $\lim_{x\to-1} \frac{\sqrt{x+4}-3}{x+1}$

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