Section 4.4

I. Limits at Infinity $\lim\limits_{x\to\infty} f(x) = L$

a. Informal Sense: The computed values of $y = f(x)$ can be made arbitrarily close to the value L by choosing x sufficiently large

b. Graphical Sense: Given any (ε -) band about the horizontal line $y = L$ the graph of $y = f(x)$ can be made to lie inside that (ε -) band by choosing x sufficiently large

c. Formal Sense: For each $\varepsilon > 0$ there exists a number N such that $|f(x) - L| < \varepsilon$ whenever $x > N$

II. Limit Rules

a. Constant Rule

b. Reciprocal Rule

c. Constant Multiple Rule

d. Sum Rule

e. Difference Rule

f. Product Rule

g. Quotient Rule

h. Algebraic Power Rule

III. Special Limits A.

a. $\lim\limits_{x\to\infty} x^{-1} = \lim\limits_{x\to\infty} \frac{1}{x} = 0$

b. $\lim\limits_{x\to-\infty} x^{-1} = \lim\limits_{x\to\infty} \frac{1}{x} = 0$

c. $\lim\limits_{x\to\infty} e^{-x} = \lim\limits_{x\to\infty} \frac{1}{e^{x}} 0$

d. $\lim\limits_{x\to\infty} \frac{1}{\ln x} = 0$

e. $\lim\limits_{x\to\infty} x^{n} e^{-x} = 0, \ \ n > 0$

f. $\lim\limits_{x\to\infty} \frac{\ln x}{x^{n}} = 0, \ \ n > 0$

IV. Special Limits B.

a. $\lim_{x\to\infty} x = \infty$

b.

c. $\lim_{x\to\infty} e^x = \infty$

d. $\lim_{x\to\infty} \ln x = \infty$

V. Evalualting Limits at Infinity

a. Rational Functions

$$\lim_{x\to\infty} \frac{3x+4}{5-2x}$$

$$\lim_{x\to-\infty} \frac{3x+4}{5-2x}$$

$$\lim_{x\to\infty} \frac{28x}{x^2-15x-12}$$

$$\lim_{x\to\infty} \frac{4x^5-3x^2+2x-8}{10x^5-3x^4+5x-96}$$

$$\lim_{x\to-\infty} \frac{2x^6-5x^3+4}{74x^4+80x^3+19x^2+108x+256}$$

b. Others

$$\lim_{x\to\infty} \frac{\sin 4x}{e^x}$$

$$\lim_{x\to\infty} \frac{x\ln x}{e^x}$$

$$\lim_{x\to\infty} \sqrt{\frac{4x^2-1}{2x^2+x+4}}$$

$$\lim_{x\to\infty} \frac{x^\pi+x^3}{x^{22/7}}$$