

MATH 34A: LIMIT AND SUMMATION

LIMIT

What does this notation mean?

$$\lim_{x \rightarrow a} f(x) = ?$$

In general, we can find the limit from the graph or directly from the function.

1. Let $f(x)$ be a function whose graph is shown below.

Find the following.

a) $\lim_{x \rightarrow -\infty} f(x)$

b) $\lim_{x \rightarrow -1} f(x)$

c) $\lim_{x \rightarrow 2} f(x)$

d) $f(2)$

e) $\lim_{x \rightarrow 3} f(x)$

2. Find the following limits or explain why it doesn't exist.

a) $\lim_{x \rightarrow 4} (2x - 1)$

b) $\lim_{x \rightarrow \infty} \frac{6}{x^2}$

c) $\lim_{x \rightarrow \infty} \frac{4x+7}{x+3}$

d) $\lim_{x \rightarrow \infty} \frac{9x+1}{x^3-85}$

e) $\lim_{x \rightarrow 3} \frac{(x-3)(x+3)}{x-3}$

*3. If I have a fraction of polynomials and I want to evaluate the limit as x goes to infinity, i.e.

$$\lim_{x \rightarrow \infty} \frac{a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0}{b_m x^m + b_{m-1} x^{m-1} + \cdots + b_1 x + b_0} = ?$$

what would it be in general? (Hint: think of the cases when $n > m$, $n = m$, and $n < m$.)

*4. If $f(x)$ a continuous function, at any point $x = a$, what is the relationship between

$$\lim_{x \rightarrow a} f(x) \text{ and } f(a)?$$

(Hint: try to draw a random graph for a continuous function f and think of what the limit is.)

SUMMATION NOTATION

What does this notation mean?

$$\sum_{j=1}^N a_j = ?$$

Examples.

$$1. \sum_{k=1}^3 k^2 =$$

$$2. \sum_{j=1}^3 j^2 =$$

$$3. \sum_{n=4}^{10} (n+1) =$$

$$4. \sum_{m=-5}^3 (2x^m) =$$

$$5. \sum_{l=0}^4 a_l - \sum_{p=1}^3 a_{2p} =$$