

Limit problems (§§1.1–1.3)

1. By graphing, figure out what the following limits are. (This is not 100% rigorous, but that is acceptable for now.)

(a) $\lim_{x \rightarrow \infty} \tan^{-1} x$

(b) $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$

2. Let

$$f(x) = \begin{cases} x^2 - x & \text{if } x < 2, \\ \frac{1}{x^3} & \text{if } x \geq 2. \end{cases}$$

Find:

(a) $\lim_{x \rightarrow 2^-} f(x)$

(b) $\lim_{x \rightarrow 2^+} f(x)$

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

3. Find $\lim_{x \rightarrow \infty} \frac{3x^3 - 20x^2 + 47x + 16}{2x^3 + 32x^2 + 12x - 7}$.

4. Find $\lim_{x \rightarrow 3} \frac{x^2 + 4x - 21}{x^2 - 5x + 6}$.