Math 1A: Calculus

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Handout: Limits at Infinity and Horizontal Asymptotes

Discussions 201, 203 // 2018-09-19

Problem 1. Compute the limit

$$\lim_{x \to \infty} \left(\frac{6x^2 + 2}{3x + 7} - \frac{4x + 5}{2} \right).$$

Problem 2. For this problem, we will consider the function

$$f(x) = \frac{e^x - 1}{e^x + 1}.$$

- (1) What is the domain of *f*?
- (2) Is *f* even, odd, or neither?
- (3) Compute $\lim_{x \to -\infty} f(x)$.
- (4) Compute $\lim_{x\to\infty} f(x)$. Be careful with limit laws.
- (5) Sketch the graph of y = f(x), keeping in mind your answers to the above questions.

Problem 3. For this problem, we will consider the function

$$g(x) = \frac{7x^2 + 5}{x^2 - 4x + 3} + \frac{\sqrt{x^2 - 4}}{4x + 1}.$$

- (1) What is the domain of *g*?
- (2) Find all vertical asymptote(s) of g. Additionally, for each vertical asymptote x = a, determine $\lim_{x \to a^-} g(x)$ and $\lim_{x \to a^+} g(x)$.

- (3) Compute lim g(x).
 (4) Compute lim g(x).
 (5) Sketch the graph of y = g(x), keeping in mind your answers to the above questions.