

**MATH 301/501 HOMEWORK-5 DUE AT THE BEGINNING OF CLASS ON
TUESDAY, OCTOBER 28.**

One goal for this course is for you to develop your skill in effectively communicating mathematics. With this in mind, you should clearly write up your solutions.

- (1) Give a clear definition of a horizontal asymptote that would be appropriate for a high school algebra student. (A good definition will correctly convey the precise meaning of a limit, with vocabulary and notation appropriate to a beginning student.)
- (2) If you are a graduate student, or if you have taken MAT 319, explain how your definition coincides with that which could be given in an analysis class.
- (3) Give an example of a rational function that has a horizontal asymptote at $y = b$, for some $b \in \mathbb{R}$, and such that, for some a in the domain of f , $f(a) = b$. Include a *clear* graph of the function, appropriately scaled, on *labelled* coordinate axes.
- (4) In class we looked at the rational function $f(x) = \frac{2x^2+x+1}{x}$, which has a *slant asymptote*.
 - (a) Sketch a clear graph of the function, identify the slant asymptote, and explain how to find it.
 - (b) Give an example of a rational function $g(x)$, (which does not have a constant denominator), with the property that $g(x)$ approaches a quadratic function as $x \rightarrow \infty$.
 - (c) Explain your work from part *b*, and sketch the graph of $g(x)$.
- (5) In class some students wrote:

$$\frac{(x+4)(x-7)^2(x+10)}{(x+1)(x-7)(x+10)^2} = \frac{(x+4)(x-7)}{(x+1)(x+10)}.$$

- (a) Explain the extent to which this equality is correct, and explain how it is incorrect.
 - (b) Explain how you articulate this distinction to your high school students, without explicitly discussing equivalence relations?
- (6) Go back over your homework, and make sure you spell *asymptote* correctly everywhere you use the term.