MAE 501 HOMEWORK–6 DUE AT THE BEGINNING OF CLASS ON THURSDAY, OCTOBER 20

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) (a) Write a clear, concise definition of a vertical asymptote that would be appropriate for an advanced undergraduate mathematics major.

    (b) Write a clear, concise definition of a vertical asymptote that would be appropriate for a high school algebra student.

    (c) Carefully explain how these definitions coincide.

(2) (a) Give an example of a non-constant rational function f that satisfies both the following:

    (i)
$$\lim_{x \to \infty} f(x) = 0.$$

    (ii) There exists a in the domain of f that satisfies $f(a) = 0$.

    (b) Sketch a graph of your function on clearly labeled and scaled coordinate axes.

(3) Explain how the term "limit" has a different meaning in mathematics than it does in casual language."

(4) Think of three more terms whose meanings in mathematics are distinct from their meanings in casual language, and carefully explain those distinct meanings.

(5) (a) Look at the Regents exam problems and solutions given on the second page of this document.

    (b) Write 3-4 paragraphs in which you carefully discuss mathematical inconsistencies among the problems and their proposed solutions.

New York State Regents Exam Problems

(a) The expression

$$\frac{\frac{x}{x+2}}{1 - \frac{x}{x+2}}$$

is equivalent to:

(i) $\frac{2}{x}$

(ii) $\frac{x}{2}$

(iii) $\frac{2x}{x+2}$

(iv) $\frac{2x}{x^2+4}$.

Solution is given as (ii).

(b) When simplified, the complex fraction

$$\frac{1 + \frac{1}{x}}{\frac{1}{x} - x},$$

$x \neq 0$, is equivalent to:

(i) 1

(ii) -1

(iii) $\frac{1}{1-x}$

(iv) $\frac{1}{x-1}$

Solution is given as (iii).

(c) For all values of x for which the expression is defined,

$$\frac{2x + x^2}{x^2 + 5x + 6}$$

is equivalent to:

(i) $\frac{1}{x+3}$

(ii) $\frac{x}{x+3}$

(iii) $\frac{1}{x+2}$

(iv) $\frac{x}{x+2}$

Solution is given as (ii).