MATH 121 **EXAM III** **FALL 1996**

Show all your work to obtain credit for the problems.

Name of Teaching Assistant:____

Write **your** name and the name of your TA on the exam booklet.

1. (13 points) Let $f(x) = \frac{x+13}{x^2-7x+10}$. Identify the horizontal and vertical asymptotes for $y = f(x)$. Find the x and y intercepts. Draw a sketch of the graph.

2. (12 points) What does $f(x)$ (as in 1) approach as:

a) $x \to -2^-$

b) $x \to +2^+$

c) $x \to -\infty$

d) $x \to +\infty$

3. (12 points) Find a, b and d so that the rational function $f(x) = \frac{ax+b}{x+d}$ has:

horizontal asymptote y=3,

vertical asymptote x=5

an intercept with the y axis at $y = 8$.

4. (13 points) Use long division of polynomials to determine the end behaviour asymptote of $y = f(x) = \frac{5x^3+2x^2+x+2}{x^2-1}$.

5. (10 points) Simplify the trig expression $\tan(\arccos(\frac{x}{5}))$. Assume that the angles involved are in the first quadrant.

6. (10 points) Prove the identity:

$$\frac{\cos^2 x - 1}{\sin x} = -\tan x \sin x.$$

7. (15 points)

a) Find **all** (not just some) of the vertical asymptotes of the graph $y = \tan(2x - 1) + 5$.

b) Describe **in words** how the graph of part a) is obtained from the graph of $y = \tan(x)$. (A sketch of the graph is **NOT** required.)

c) What is the period of $f(x) = \tan(2x - 1) + 5$?

8. (15 points) A ball thrown at angle θ and initial velocity v_o (in feet/second) travels a distance in feet of $d = (\frac{1}{32})v_o^2 \sin(2\theta)$. If Alfred E. Neumann throws a ball a distance of 400 feet, with initial velocity of 125 feet/sec., what was the throwing angle θ (in degrees, to 2 decimal places)?