

Name: \_\_\_\_\_

Show all work on the quiz in the space provided. Correct answers without work will not receive credit.

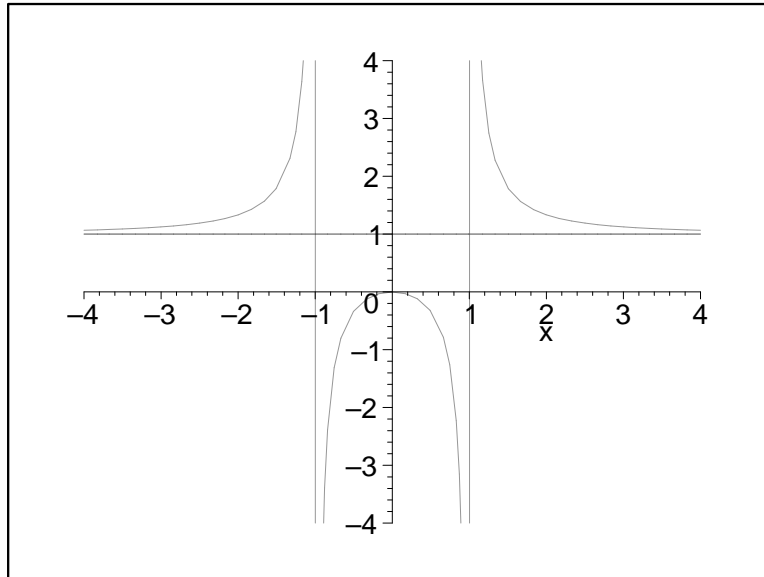
(5 points) 1. For the rational function  $R(x) = \frac{3x^2 + 4x + 1}{x^2 - 25}$ , state the domain and give all horizontal and vertical asymptotes.

Domain:  $x^2 - 25 = (x - 5)(x + 5) = 0$  for  $x = 5$  or  $x = -5$ , so the domain is  $\{x | x \neq 5 \text{ and } x \neq -5\}$

Since  $3x^2 + 4x + 1 = (3x + 1)(x + 1)$ , the function is in lowest terms and so there are vertical asymptotes  $x = 5$ ,  $x = -5$ .

The degree of the numerator (2) is equal to the degree of the denominator (also 2), so there is a horizontal asymptote  $y = \frac{3}{1}$ , i.e.  $y = 3$ .

(5 points) 2. For the graph shown, find the domain, vertical and horizontal asymptotes.



The domain is  $\{x|x \neq 1 \text{ and } x \neq -1\}$ . There is a horizontal asymptote  $y = 1$ , and vertical asymptotes  $x = 1, x = -1$ .

BONUS (2 points) Give a rational function which might have the above graph.

Because the vertical asymptotes are  $x = 1$  and  $x = -1$ , there must be a factor of  $(x + 1)(x - 1)$  in the denominator. A horizontal asymptote  $y = 1$  means the degree of numerator is equal to the degree of the denominator and the ratio of leading terms is 1. Since the graph contains the point  $(0, 0)$ , the function  $R(x) = \frac{x^2}{x^2 - 1}$  is a rational function whose graph looks like the above. (Many answers are possible, but must have these characteristics.)