

Name: Solutions

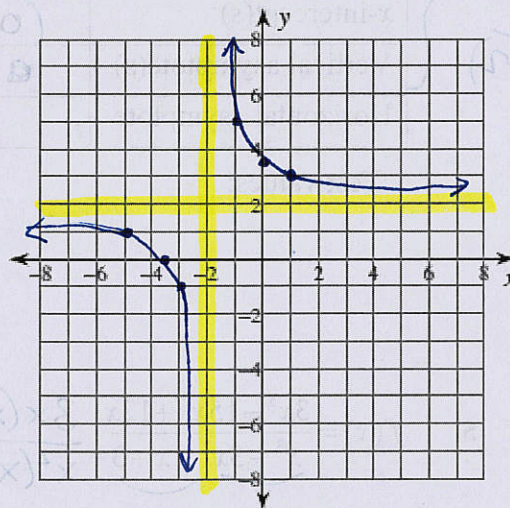
Date: \_\_\_\_\_

**Instructions:** Graph each rational expression using the procedure discussed in class. You must be able to do this WITHOUT a calculator, though you are free to check your work with a calculator when finished. You may use your calculator TABLE feature to generate test values.

1.  $f(x) = \frac{2x+7}{x+2}$   $x \neq -2$   $2x+7=0$   
 $x = -7/2$   $\frac{2x}{x} = 2$

|                       |  |
|-----------------------|--|
| Domain                | $(-\infty, -2) \cup (-2, \infty)$  |
| y-intercept           | $\frac{0+7}{0+2} = \frac{7}{2} \rightarrow (0, \frac{7}{2})$ or $(0, 3.5)$ |
| x-intercept(s)        | $-7/2 \rightarrow (-\frac{7}{2}, 0)$ or $(-3.5, 0)$                        |
| Vertical asymptote(s) | $x = -2$   |
| Horizontal asymptote  | $y = 2$  |

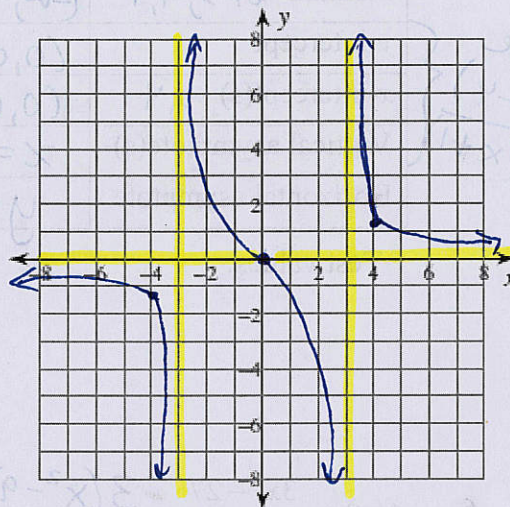
Test values:



2.  $f(x) = \frac{2x}{x^2-9}$   $x \neq 3, -3$   $2x=0$   
 $x=0$   $\frac{2x}{x^2} = \frac{2}{x}$

|                       |   |
|-----------------------|---|
| Domain                | $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$ |
| y-intercept           | $\frac{0}{-9} = 0 \rightarrow (0, 0)$         |
| x-intercept(s)        | $0 \rightarrow (0, 0)$                        |
| Vertical asymptote(s) | $x = 3$ $x = -3$                              |
| Horizontal asymptote  | $y = 0$                                       |

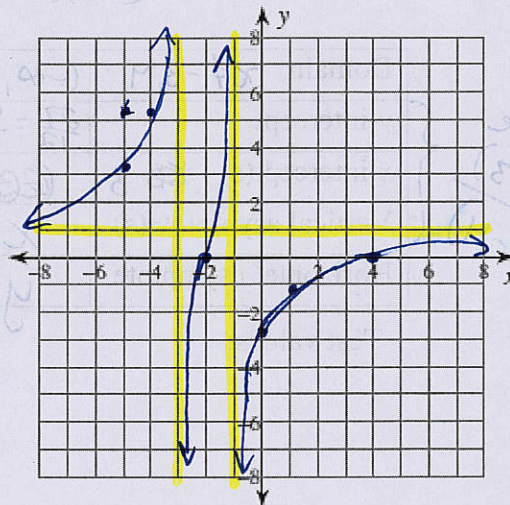
Test values:



3.  $f(x) = \frac{x^2-2x-8}{x^2+4x+3}$   $\frac{(x+2)(x-4)}{(x+3)(x+1)}$   $x \neq -3, -1$   $\frac{x^2}{x^2} = 1$

|                       |   |
|-----------------------|---|
| Domain                | $(-\infty, -3) \cup (-3, -1) \cup (-1, \infty)$ |
| y-intercept           | $-\frac{8}{3} \rightarrow (0, -8/3)$            |
| x-intercept(s)        | $-2, 4$<br>$(-2, 0)$ $(4, 0)$                   |
| Vertical asymptote(s) | $x = -3$ $x = -1$                               |
| Horizontal asymptote  | $y = 1$   |

Test values:

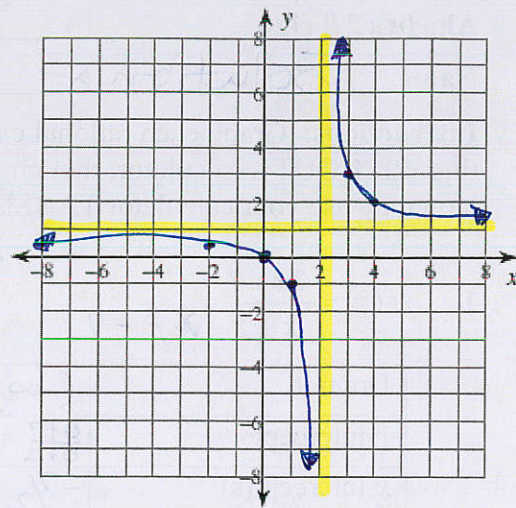


4.  $f(x) = \frac{x^2 + 3x}{x^2 + x - 6} = \frac{x(x+3)}{(x-2)(x+3)} \rightarrow x \neq 2, -3$   $(x+3) \rightarrow \text{HOLE}$

use  $\frac{x}{x-2}$

|                       |   |
|-----------------------|---|
| Domain $x \neq 2, -3$ | $(-\infty, -3) \cup (-3, 2) \cup (2, \infty)$ |
| y-intercept           | $(0, 0)$                                      |
| x-intercept(s)        | $(0, 0)$                                      |
| Vertical asymptote(s) | $x = 2$                                       |
| Horizontal asymptote  | $y = 1$                                       |

Test values:

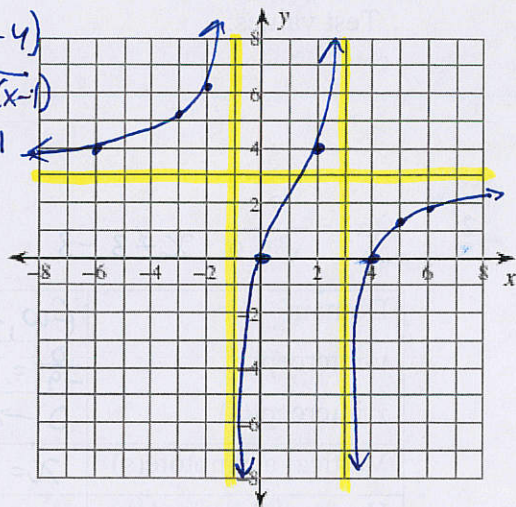


5.  $f(x) = \frac{3x^3 - 15x^2 + 12x}{x^3 - 3x^2 - x + 3} = \frac{3x(x^2 - 5x + 4)}{x^2(x-3) - 1(x-3)} = \frac{3x(x-1)(x-4)}{(x-3)(x+1)(x-1)}$   $(x-1) \rightarrow \text{HOLE}$

use  $\frac{3x(x-4)}{(x-3)(x+1)}$

|                          |   |
|--------------------------|---|
| Domain $x \neq 3, -1, 1$ | $(-\infty, -1) \cup (-1, 1) \cup (1, 3) \cup (3, \infty)$ |
| y-intercept              | $(0, 0)$  |
| x-intercept(s) $0, 4$    | $(0, 0) + (4, 0)$   |
| Vertical asymptote(s)    | $x = 3 \quad x = -1$                                      |
| Horizontal asymptote     | $y = 3$   |

Test values:



6.  $f(x) = \frac{3x^2 - 27}{x^2 - x - 12} = \frac{3(x^2 - 9)}{(x+3)(x-4)} = \frac{3(x+3)(x-3)}{(x+3)(x-4)}$   $\text{HOLE}$

use  $\frac{3(x-3)}{(x-4)}$

|                             |   |
|-----------------------------|---|
| Domain $x \neq -3, 4$       | $(-\infty, -3) \cup (-3, 4) \cup (4, \infty)$       |
| y-intercept                 | $\frac{27}{4} = \frac{9}{4} \quad (0, \frac{9}{4})$ |
| x-intercept(s) <del>3</del> | <del>(3, 0)</del> $(3, 0)$                          |
| Vertical asymptote(s)       | $x = 4$   |
| Horizontal asymptote        | $y = 3$   |

Test values:

