

Graphing Rational Functions Worksheet

Key

For the following function, find:

- (a) the x -intercepts, y -intercepts
- (b) the vertical asymptote(s)
- (c) the horizontal asymptote
- (d) the holes
- (e) any additional points needed
- (f) then, graph the function.

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

See graph paper for a-d answers.

4. $y = \frac{x^2 - 5x + 6}{x^2 - 4x + 3}$

2. $y = \frac{8}{x^2 - x - 6}$

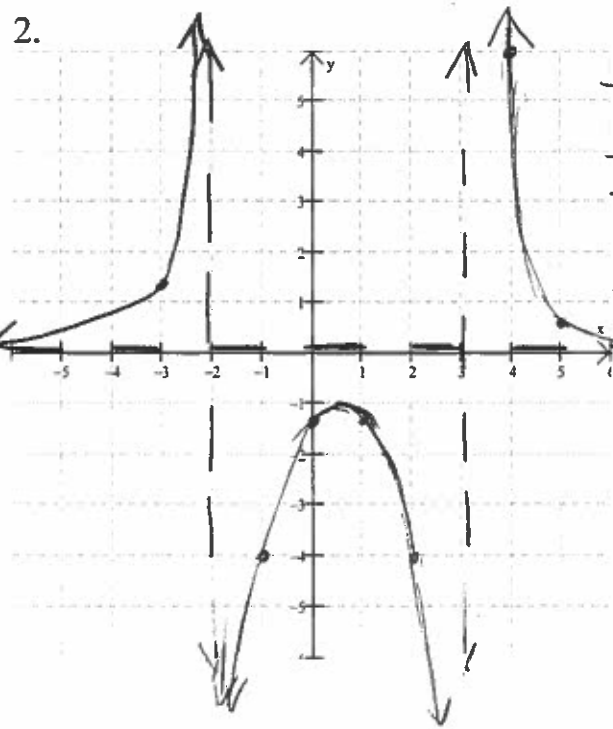
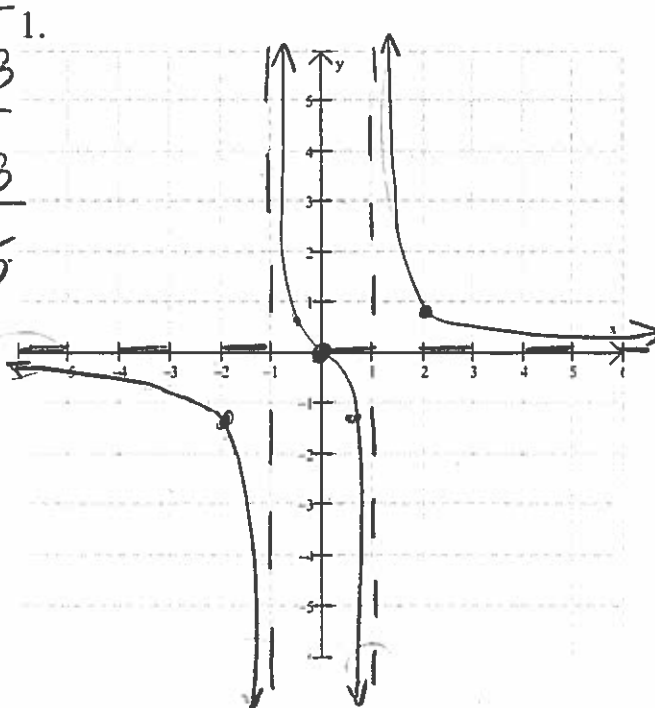
5. $y = \frac{x^2 + 11x + 18}{2x + 1}$

3. $f(x) = \frac{x^2 - 9}{2x^2 + 1}$

6. $g(x) = \frac{x - 4}{x^2 - 3x}$

e)

x	f(x)
1/2	-4/3
-2	-4/3
2	4/5

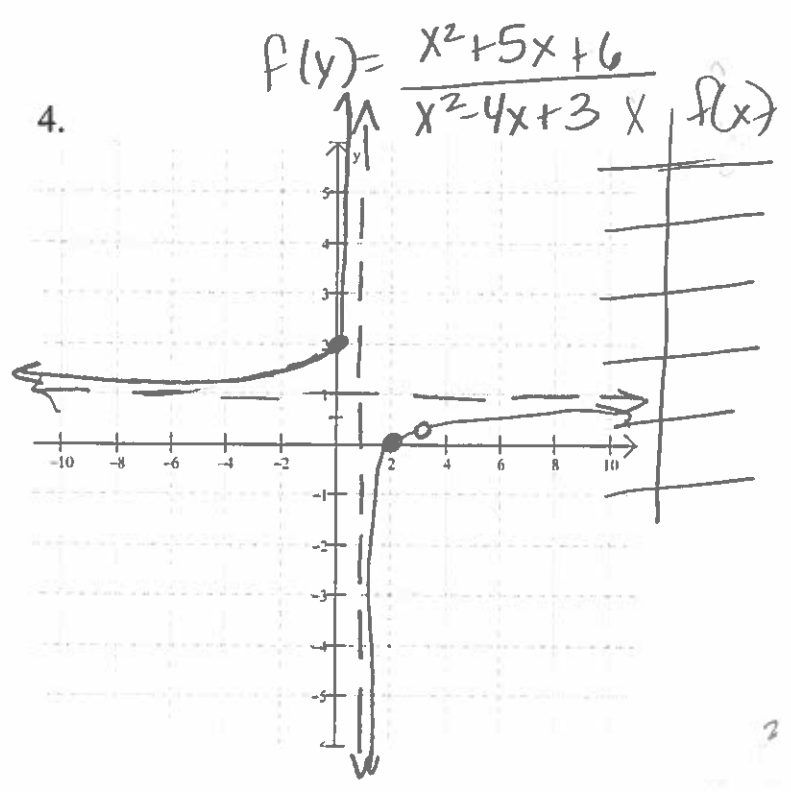
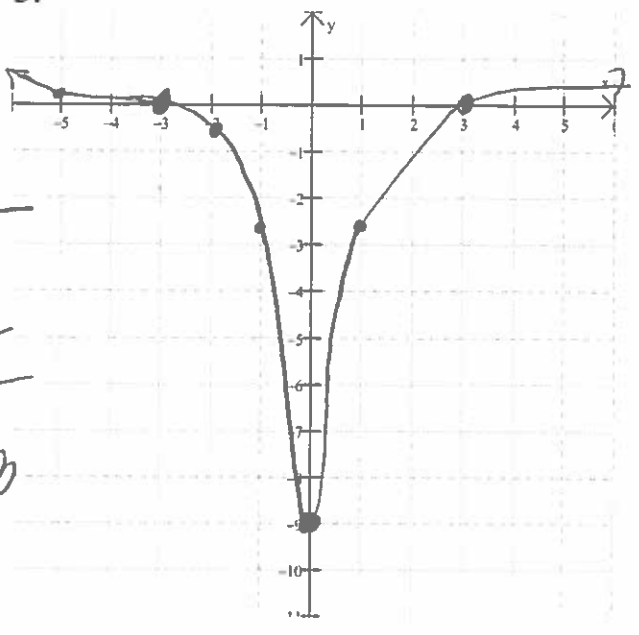


e)

x	y
2	-4
-1	-4
4	6
3	4/3
1	-4/3
5	4/3

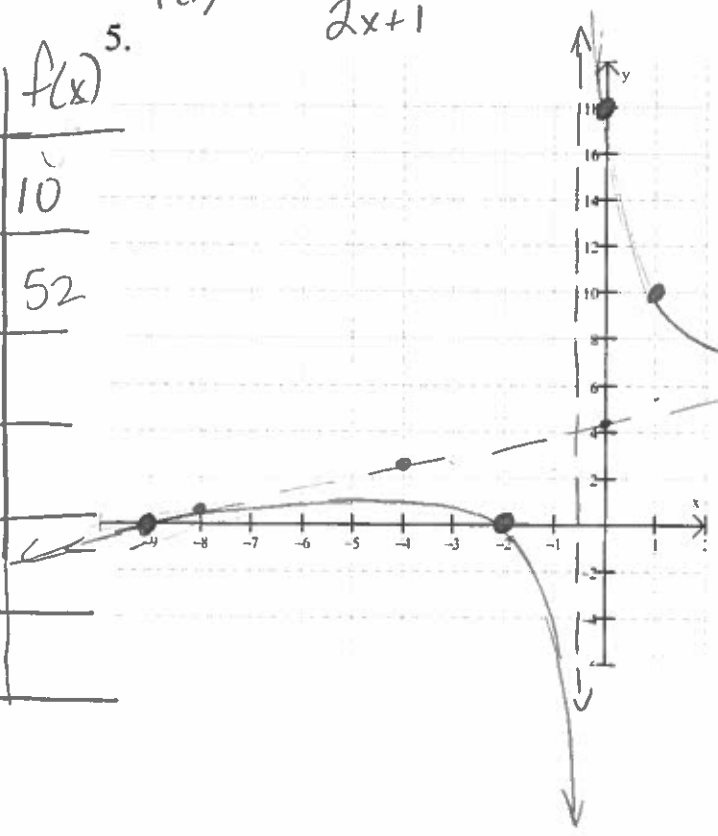
x	y
-5	$\frac{16}{51}$
-2	$\frac{-5}{9}$
1	$\frac{-8}{3}$
2	$\frac{-5}{9}$
4	$\frac{7}{33}$

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

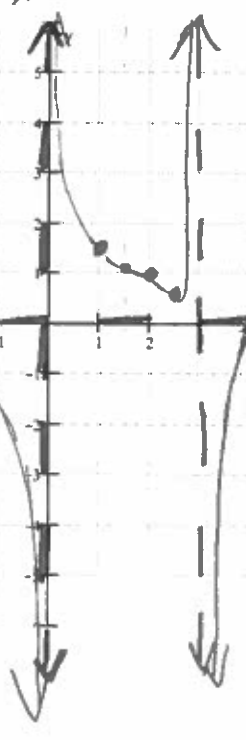


x	f(x)
1	10
2	52
-1	

5. $f(x) = \frac{x + 11x + 18}{2x + 1}$



6. $f(x) = \frac{x - 4}{x^2 - 3x}$



x	y
1	$\frac{3}{2}$
2	1
5	$\frac{1}{10}$
-1	-1.25
-2	$\frac{3}{5}$
-3	-38
$\frac{5}{2}$	$\frac{6}{10}$
$\frac{3}{2}$	$\frac{10}{9}$

Graphing Rational Functions Worksheet

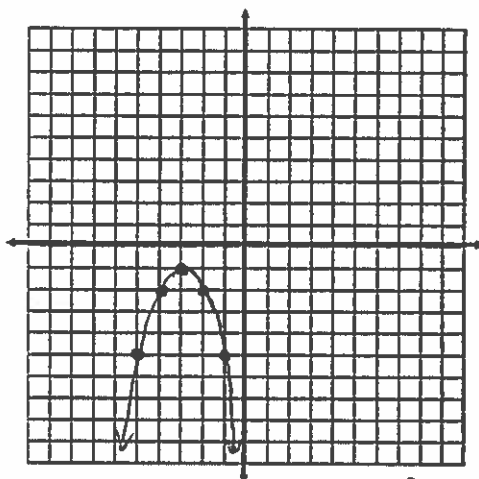
	a) ^{when y=0} x int	when x=0 y int	b) ^{non removable zeros in denom} vertical asympt	c) H) ^{s)} horiz/slant	d) ^{removable factors} holes
1) $f(x) = \frac{2x}{x^2-1}$ $f(x) = \frac{2x}{(x+1)(x-1)}$	(0,0)	(0,0)	$x=-1, x=1$	H) $n < m$ $y=0$ S) none	none
2) $y = \frac{8}{x^2-x-6}$ $y = \frac{8}{(x-3)(x+2)}$	none	$(0, -\frac{4}{3})$	$x=3$ $x=-2$	H) $n < m$ $y=0$ S) none	none
3) $f = \frac{x^2-9}{2x^2+1}$	$(3,0)$ $(-3,0)$	$(0,-9)$	$2x^2+1 \neq 0$ (no real solut) <u>none</u>	<u>none</u>	<u>none</u>
4) $y = \frac{x^2-5x+6}{x^2-4x+3}$ $y = \frac{(x-2)(x-3)}{(x-3)(x-1)}$	$(2,0)$	$(0,2)$	$x=1$	HA) $n=m$ $y=1$ SA) none	$(3, \frac{1}{2})$ ↓ $\frac{1}{2} = \frac{3-2}{3-1}$
5) $y = \frac{x+11x+18}{2x+1}$	$(-9,0)$ $(-2,0)$	$(0,18)$	$x = -\frac{1}{2}$	HA) $n > m$ none SA) $y = \frac{1}{2}x + \frac{21}{4}$	none
6) $\frac{x-4}{x^2-3x} = g(x)$	$(4,0)$	none	$x=0$ $x=3$	HA) $n < m$ $y=0$ SA) none	none

Directions: Without a calculator, give the name of the parent function, give the equation of the parent function, graph the given function and the parent function, and describe the transformation of the parent function to the given function.

1. $g(x) = -(x+3)^2 - 1$ Name of Parent Function: quadratic

Equation of Parent Function: $y = x^2$ (or $f(x) = \sqrt{x}$)

Graph:

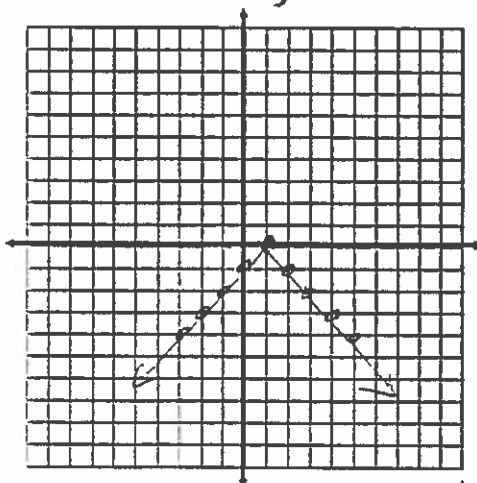


Transformation: reflect, left + 3, down 1
(opens down)

2. $g(x) = -|x-1|$ Name of Parent Function: absolute value

Equation of Parent Function: $y = |x|$ (or $f(x) = \sqrt{x}$)

Graph:



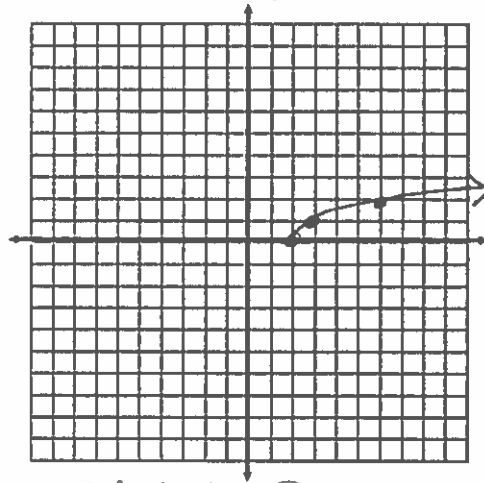
Transformation: right 1, reflected
(opens down)

3. $h(x) = \sqrt{x-2}$

Name of Parent Function: radical

Equation of Parent Function: $y = \sqrt{x}$ (or $f(x) = \sqrt{x}$)

Graph:



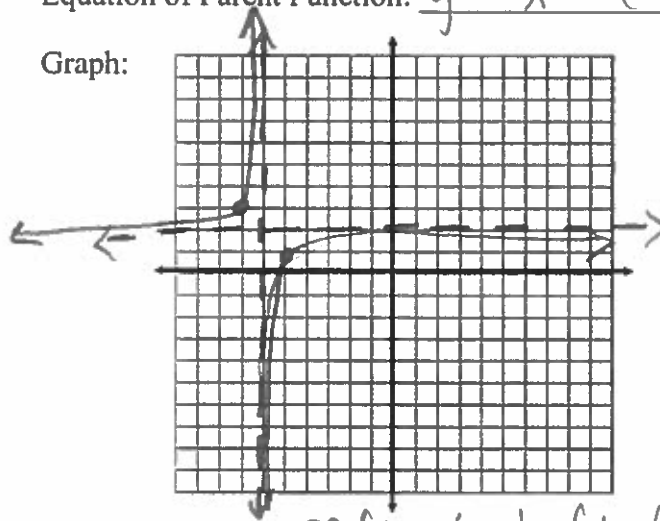
Transformation: right 2

4. $g(x) = -\frac{1}{x+6} + 2$

Name of Parent Function: rational

Equation of Parent Function: $y = \frac{1}{x}$ (or $f(x) = \frac{1}{x}$)

Graph:



Transformation: reflect, left 6, up 2

Directions: Identify the domain and range of the function using interval notation (you may want to sketch a graph). Describe the transformation of the given function from its parent function.

5. $g(x) = \sqrt{x-1}$ Domain: $x \geq 1$ Range: $y \geq 0$
Transformation: right 1

6. $h(x) = -x^2 + 1$ Domain: \mathbb{R} Range: $y \leq 1$
Transformation: reflection about x-axis, up 1 unit

7. $h(x) = -|x-2|$ Domain: \mathbb{R} Range: $y \leq 0$
Transformation: reflection about x-axis, right 2

8. $f(x) = \frac{1}{(x+2)^2} - 4$ Domain: \mathbb{R} except -2 Range: \mathbb{R} except -4
Transformation: left 2, down 4

9. $h(x) = -(x+9)^2$ Domain: \mathbb{R} Range: $y \leq 0$
 $(-9, 0)$ Transformation: reflection about x-axis, left 9

Directions: Given the parent function and a description of the transformation, write the equation of the transformed function, $f(x)$.

10. Absolute value—vertical shift up 5, horizontal shift right 3.

$f(x) = |x-3| + 5$

11. Square Root— Reflection over the x-axis, horizontal shift left 2.

$f(x) = -\sqrt{x+2}$

Rational

12. Inverse Variation (odd power) — Reflection over the x-axis, horizontal shift left 8, vertical translation down 3.

$f(x) = -\frac{1}{x+8} - 3$

Solve each of the following radical equations. Make sure to check all answers in the original equation.

1) $\sqrt{x} = 5$ $x = 25$

2) $2\sqrt{x} = 8$ $x = 16$

3) $\sqrt{p^2+1} = 5$ $p = \pm 2\sqrt{6}$

4) $\sqrt{z^2-3} = 7$

$x = 2\sqrt{13}$

5) $\sqrt{2x^2+5x+2} = 3$

$x = -\frac{7}{2}$ or 1

6) $\sqrt{z^2-6z+9} = 7$

$x = -4$ or 10

22) $\sqrt{x+12} - \sqrt{x} = 2$

$x = 4$

23) $\sqrt{4-m} + \sqrt{m+6} = 4$

$m = -5$ or 3

24) $\sqrt{7-n} + \sqrt{n+11} = 6$

$n = -2$

28) $\sqrt[3]{3x-1} = -3$

$x = -\frac{26}{3}$

29) $\sqrt[3]{2n-5} = -2$

$n = -\frac{3}{2}$

30) $\sqrt[3]{2x+1} = -3$

$x = -122$

1) $\frac{1}{12y^2} = \frac{1}{6y^2} - \frac{1}{y}$

$y = \frac{1}{12}$

6) $\frac{2}{x+1} - \frac{1}{x^2-8x-9} = \frac{1}{x+1}$

$x = 10$

2) $\frac{1}{g} = \frac{5}{2g} + 4$

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~~$g = -\frac{5}{7}$~~ extraneous

7) $\frac{1}{x-9} + \frac{1}{x^2-12x+27} = \frac{2}{x-9}$

$x = 4$ ✓

3) $\frac{s+9}{8s^2} + \frac{11}{4s^2} = \frac{s-12}{4s^2}$

$s = 55$ ✓

8) $8 + \frac{x^2-67x+17}{8x} = \frac{4x+5}{8x}$

$x = 3$ or $x = 4$