Day 1 Homework

For each of the rational functions find: **a. domain** **b. x-intercept(s)** **c. y-intercept**

Graph #8 and #10 with at least 3 EXACT points per curve.

1. $f(x)=\dfrac{x^2+x-2}{x^2-x-6}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

2. $f(x)=\dfrac{2x^2}{x^2-1}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

3. $h(x)=\dfrac{\sqrt{9-x^2}}{x-2}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

4. $g(x)=\dfrac{\sqrt{3-x}}{(x+4)(x^2+4)}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

5. $f(x)=\dfrac{x^2+x-12}{3x^2-27}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

6. $f(x)=\dfrac{1}{x}+\dfrac{6}{x-2}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

7. $f(x)=\sqrt{x^2-9x+20}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

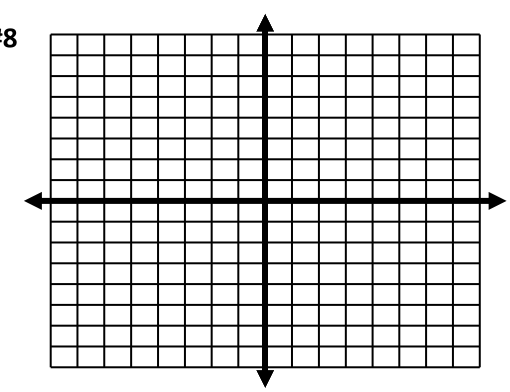
8. $f(x)=\dfrac{x^2-x-2}{x-1}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

Graph #8



9. $f(x)=\dfrac{x^2-9}{x^2-2x-3}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

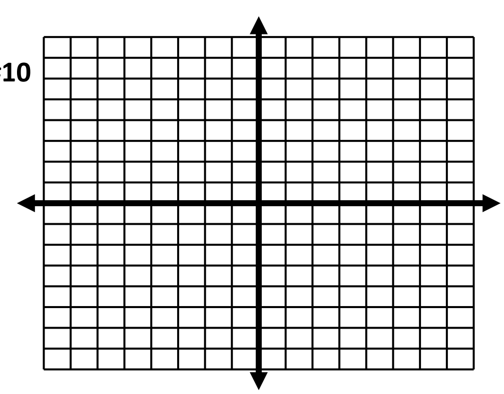
10. $f(x)=\dfrac{\sqrt{x+7}}{x^2+3x+2}$

Domain: ______________________

x-intercept(s):__________________

y-intercept:____________________

Graph #10



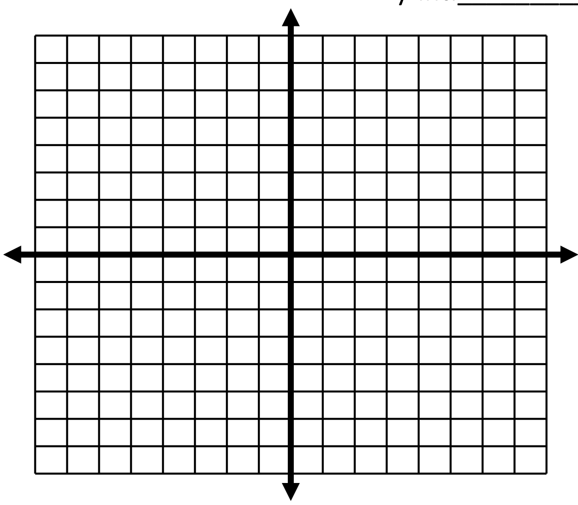
Homework Day 2

In Exercises 9-23, **graph** each function including **x and y intercepts** and give the **domain**. If the function is discontinuous, state the discontinuity and tell whether it is **removable** or **nonremovable**.

9. $f(x)=\sqrt{x^2+4}$

x-int:______________

y-int:______________



Domain:___________________________

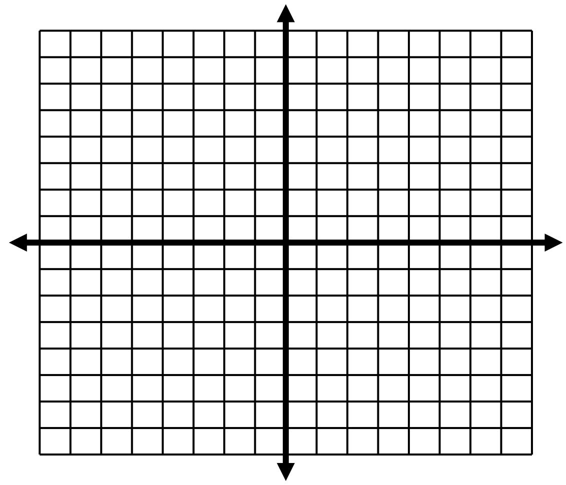
Discontinuities:___________________

Removable / Nonremovable

11. $f(x)=\dfrac{3x-1}{(x+3)(x-1)}$

x-int:______________

y-int:______________



Domain:___________________________

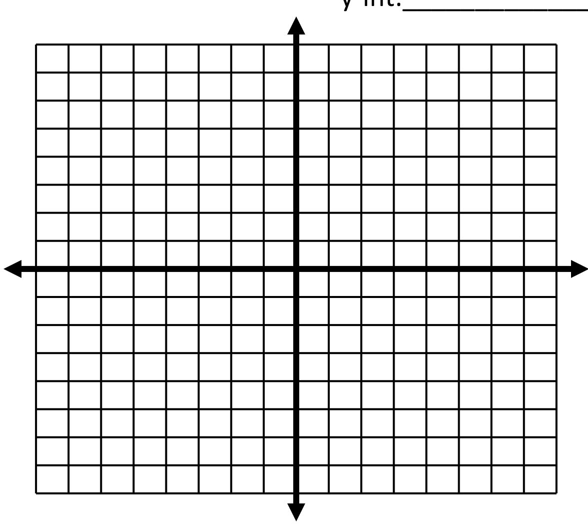
Discontinuities:___________________

Removable / Nonremovable

13. $g(x)=\dfrac{x}{x^2-5x}$

x-int:______________

y-int:______________



Domain:___________________________

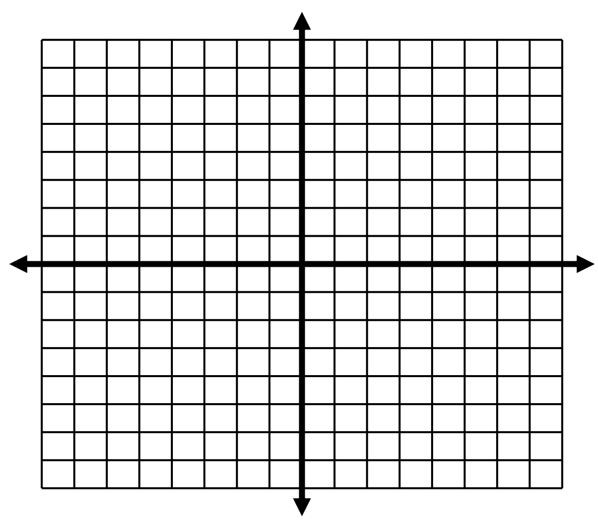
Discontinuities:___________________

Removable / Nonremovable

15. $h(x)=\dfrac{\sqrt{4-x}}{(x+1)(x^2+1)}$

x-int:______________

y-int:______________



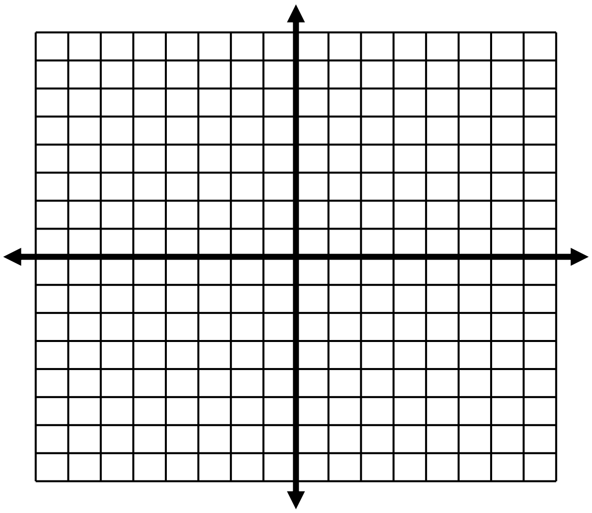
Domain:___________________________

Discontinuities:___________________

Removable / Nonremovable

16. $f(x)=\sqrt{x^4-16x^2}$

x-int:_______________
y-int:_______________



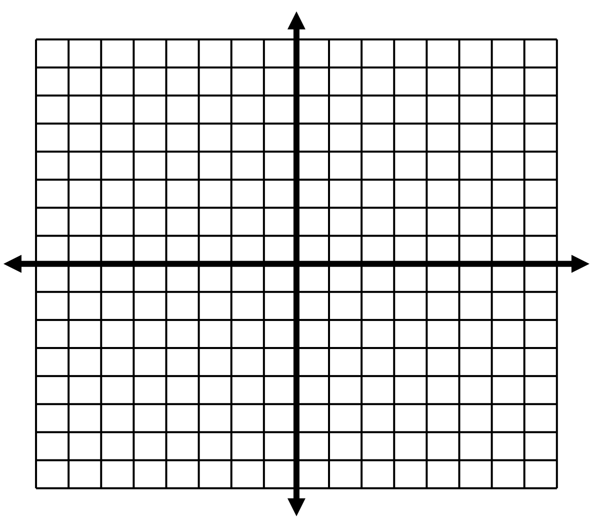
Domain:___________________________

Discontinuities:____________________

Removable / Nonremovable

21. $g(x)=\frac{3}{x}$

x-int:_______________
y-int:_______________



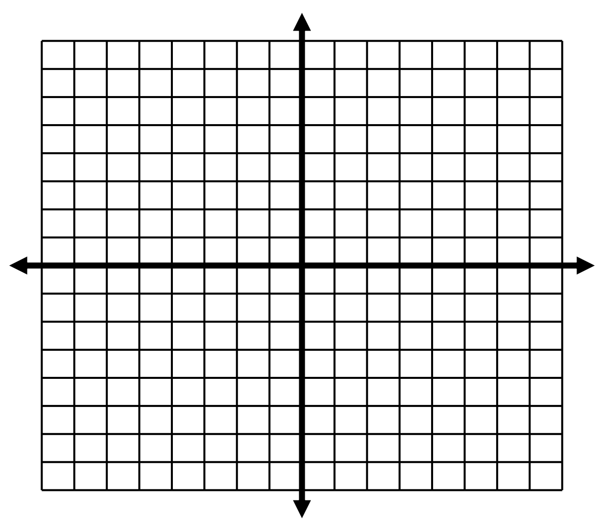
Domain:___________________________

Discontinuities:____________________

Removable / Nonremovable

23. $f(x)=\frac{|x|}{x}$

x-int:_______________
y-int:_______________



Domain:___________________________

Discontinuities:____________________

Removable / Nonremovable

Asymptote Lab Classwork Day 3

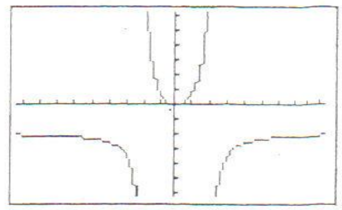
PRE – CALCULUS
Graphing Calculator Asymptote LAB

NAME

Enter equations in Y_1.
Set window as indicated.

Plot1 Plot2 Plot3
\Y1 ■(2X²)/(4−X²)
\Y2 =
\Y3 =
\Y4 =
\Y5 =
\Y6 =

WINDOW
Xmin=−9.4
Xmax=9.4
Xscl=1
Ymin=−6.2
Ymax=6.2
Yscl=1
Xres=1



Examine behavior of horizontal and vertical asymptotes using features of the table.

X	Y1
−2.003	−668.2
−2.002	−1002
−2.001	−2002
−2	ERROR
−1.999	1998.5
−1.998	998.5
−1.997	665.17

X=−2

X	Y1
−300	−2
−200	−2
−100	−2.001
0	0
100	−2.001
200	−2
300	−2

X=0

Examine and write equations for the horizontal asymptotes, vertical asymptotes or holes in each of the functions below. If none exist, write none. Look for patterns in the types of asymptotes that occur so you can answer the questions on the next page.

1. f(X)= $\frac{3X^2-1}{2X^2+1}$	2. f(x)= $\frac{3X}{X^2+1}$	3. f(x)= $\frac{x^2-4}{x+2}$	4. f(x)= $\frac{x+2}{x^2-4}$
v.a	v.a	v.a	v.a
hole:	hole:	hole:	hole:
h.a	h.a	h.a	h.a
5. f(x)= $\frac{x}{x^2-9}$	6. f(x)= $\frac{5x^2-9}{3x^2-3}$	7. f(x)= $\frac{3x^4}{x^2-16}$	8. f(x)= $\frac{x^3+1}{x+3}$
v.a	v.a	v.a	v.a
hole:	hole:	hole:	hole:
h.a	h.a	h.a	h.a
9. f(x)= $\frac{4x^3-3x^2+2x}{x^3-8}$	10. f(x)= $\frac{4x^2-12x+9}{(2x+3)^2}$	11. f(x)= $\frac{x^2-6x+9}{x-3}$	12. f(x)= $\frac{4}{x^3+8}$
v.a	v.a	v.a	v.a
hole:	hole:	hole:	hole:
h.a	h.a	h.a	h.a

QUESTIONS:

1. Give 2 examples of functions that had no vertical asymptotes.

2. Why doesn't every function with a denominator have vertical asymptotes?

3. In general, how do you find vertical asymptotes algebraically?

4. List all the functions that did not have horizontal asymptotes.

5. What do the functions that have no horizontal asymptotes have in common?

6. List all the functions that had horizontal asymptotes of $y = 0$.

7. What do functions that had horizontal asymptotes of $y = 0$ have in common?

8. List all other functions with horizontal asymptotes that have not already been listed.

9. What do all other functions with horizontal asymptotes that have not already been listed have in common?

10. Examine the equations of functions with and without horizontal asymptotes. What is a quick way to determine their horizontal asymptotes looking only at the equation, without the help of a graph or table?

Summarize how to find the equation of a horizontal asymptote for any rational function.

Homework on Domain, Range, End Behavior, and Asymptotes

In Exercises 17 and 19, find the **domain**, **range** and **end behavior**. Write the end behavior <u>using **limits**</u>.

17. $f(x) = 10 - x^2$

Domain:____________________________

Range:_____________________________

End Behavior:_______________________

19. $f(x) = \dfrac{x^2}{1-x^2}$

Domain:____________________________

Range:_____________________________

End Behavior:_______________________

In Exercises 55-61, find all **horizontal** and **vertical asymptotes** of the function.

55. $f(x) = \dfrac{x}{x-1}$ HA:____________________ VA:____________________

57. $g(x) = \dfrac{x+2}{3-x}$ HA:____________________ VA:____________________

59. $f(x) = \dfrac{x^2+2}{x^2-1}$ HA:____________________ VA:____________________

61. $g(x) = \dfrac{4x-4}{x^3-8}$ HA:____________________ VA:____________________

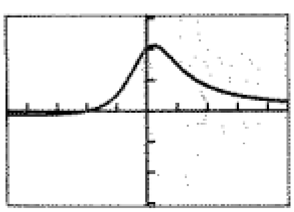
In Exercises 63-66, **match** the function with the corresponding **graph**.

63. $y = \dfrac{x+2}{2x+1}$

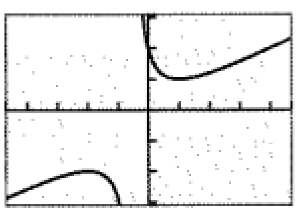
64. $y = \dfrac{x^2+2}{2x+1}$

65. $y = \dfrac{x+2}{2x^2+1}$

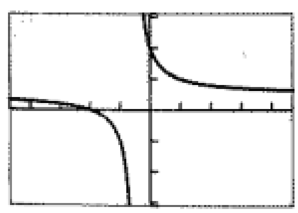
66. $y = \dfrac{x^3+2}{2x^2+1}$



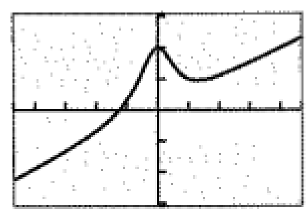
[–4.7, 4.7] by [–3.1, 3.1]
(a)



[–4.7, 4.7] by [–3.1, 3.1]
(c)



[–4.7, 4.7] by [–3.1, 3.1]
(b)



[–4.7, 4.7] by [–3.1, 3.1]
(d)

67. Can a graph cross its own asymptote? The Greek roots of the word “asymptote” mean “not meeting,” since graphs tend to approach, but not meet, their asymptotes. Which of the following functions have graphs that *do* intersect their horizontal asymptotes?

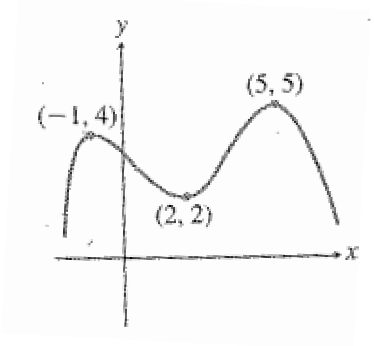
(a) $f(x) = \dfrac{x}{x^2-1}$ **(b)** $g(x) = \dfrac{x}{x^2+1}$ **(c)** $h(x) = \dfrac{x^2}{x^3+1}$

70. Explain why a graph cannot have more than 2 horizontal asymptotes.

Homework: Increasing, Decreasing, Constant Intervals & Maxima and Minima

In Exercises 25-28, state whether each labeled point identifies a local **minimum**, a local **maximum**, or **neither** (write beside each point). Identify intervals on which the function is decreasing and increasing.

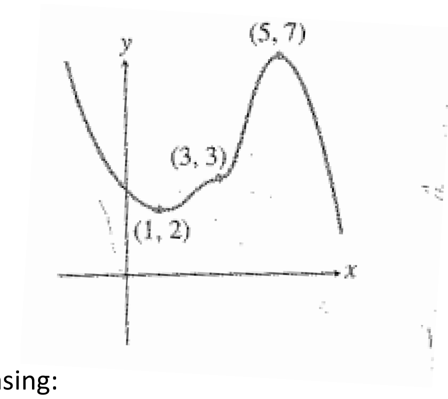
25.



Increasing:

Decreasing:

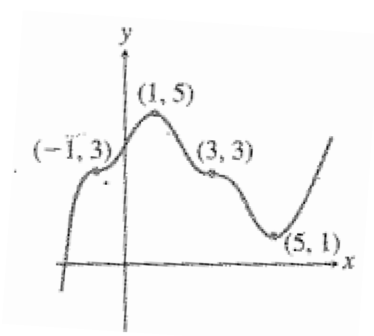
26.



Increasing:

Decreasing:

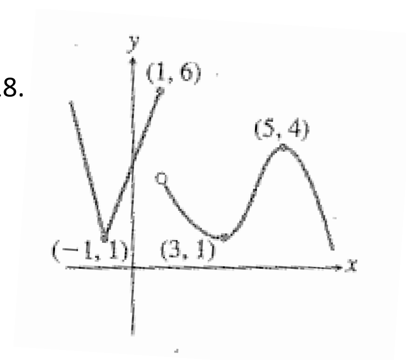
27.



Increasing:

Decreasing:

28.

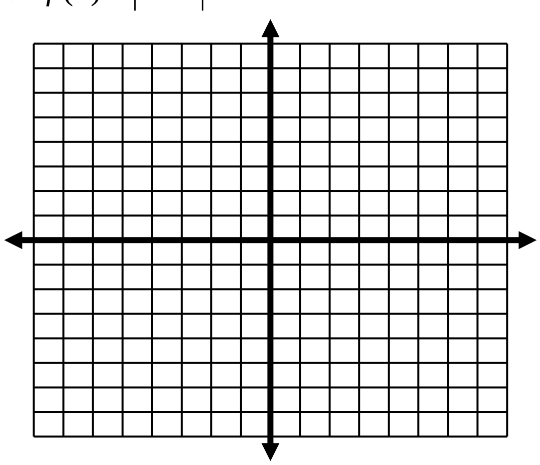


Increasing:

Decreasing:

In Exercises 29-32, **graph** the function and **identify intervals** on which the function is **increasing**, **decreasing**, or **constant**.

29. $f(x)=|x+2|-1$

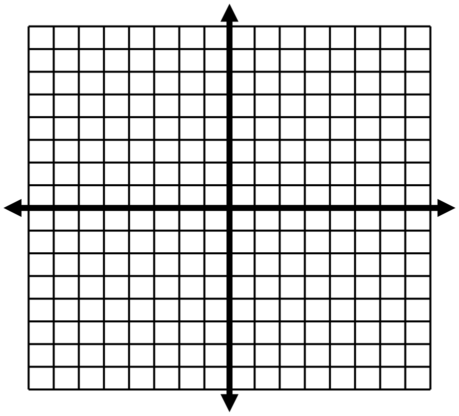


Increasing:

Decreasing:

Constant:

31. $g(x) = |x+2| + |x-1| - 2$

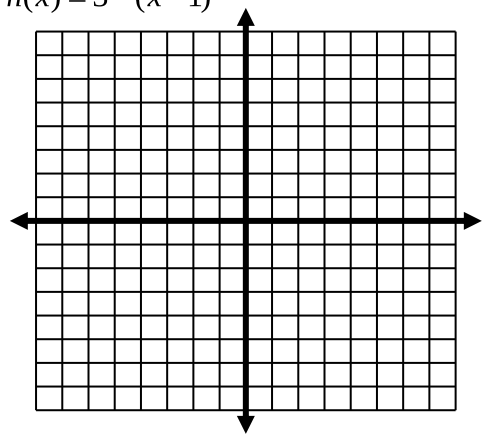


Increasing:

Decreasing:

Constant:

33. $h(x) = 3 - (x-1)^2$



Increasing:

Decreasing:

Constant:

In Exercises 41-45, use a calculator to find all **local maxima** and **minima** and the **values of x** where they occur. Give values rounded to *two decimal places*.

41. $f(x) = 4 - x + x^2$

Minima:

Maxima:

43. $g(x) = -x^3 + 2x - 3$

Minima:

Maxima:

45. $h(x) = x^2\sqrt{x+4}$

Minima:

Maxima:

Homework: Quiz #2 Review

Determine the following for the given function (#1-20). $f(x)=\dfrac{x^3+64}{x^2-16}$

1) Domain:

2) Range:

3) removable **point** of discontinuity:

4) Increasing

5) Decreasing

6) Local Min

7) Local Max

8) x-intercept(s):

9) y-intercept(s):

10) vertical asymptotes:

11) horizontal asymptotes

12) Continuous?

13) Nonremovable discontinuity?

14) $\lim\limits_{x\to\infty} f(x)$

15) $\lim\limits_{x\to-\infty} f(x)$

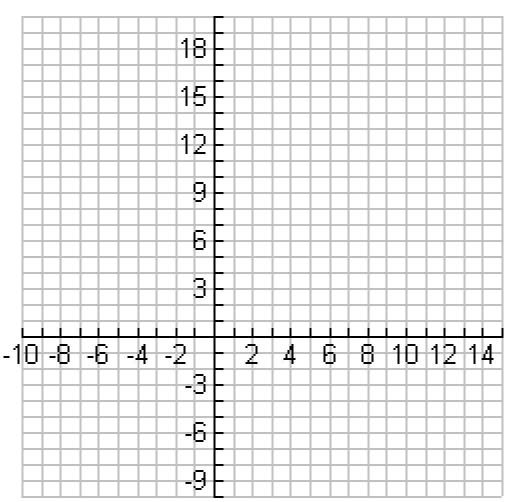
16) $\lim\limits_{x\to 4^-} f(x)$

17) $\lim\limits_{x\to 4^+} f(x)$

18) $\lim\limits_{x\to 4} f(x)$

19) $\lim\limits_{x\to -4} f(x)$

20) Sketch f(x)



21) Given: $\sqrt{2x^2+11x+14}$

Find Domain (no decimals):

Find Range:

22) Given: $\dfrac{\sqrt{x+2}}{x-3}$

Find Domain:

Find Range:

Homework: Even, Odd, and Neither Functions & Domain of Combined Functions

In Exercises 47-53, state whether the function is odd, even, or neither. Support graphically (sketch) and confirm algebraically.

47. $f(x) = 2x^4$

48. $g(x) = x^3$

49. $f(x) = \sqrt{x^2 + 2}$

50. $f(x) = \dfrac{3}{1 + x^2}$

51. $f(x) = -x^2 + 0.03x + 5$

52. $f(x) = x^3 + 0.04x^2 + 3$

53. $g(x) = 2x^3 - 3x$

72. True / False. A relation that is symmetric with respect to the x-axis cannot be a function. Justify your answer.

In Exercises 1-4, find formulas for the functions $f + g,\ f - g,$ and $fg.$ Then, give the **domain** of each function and the **domain of each combined function**.

1. $f(x) = 2x - 1;\ g(x) = x^2$

	FORMULAS →	DOMAIN
f(x) Domain:	$f + g:$	
g(x) Domain:	$f - g:$	
	$fg:$	

2. $f(x)=(x-1)^2;\ g(x)=3-x$

	FORMULAS →	DOMAIN
f(x) Domain:	$f+g:$	
g(x) Domain:	$f-g:$	
	$fg:$	

3. $f(x)=\sqrt{x};\ g(x)=\sin x$

	FORMULAS →	DOMAIN
f(x) Domain:	$f+g:$	
g(x) Domain:	$f-g:$	
	$fg:$	

4. $f(x)=\sqrt{x+5};\ g(x)=\|x+3\|$

	FORMULAS →	DOMAIN
f(x) Domain:	$f+g:$	
g(x) Domain:	$f-g:$	
	$fg:$	

In Exercises 5 and 6, find formulas for f/g and g/f. Give the domain of each functions and each combined function.

5. $f(x)=\sqrt{x+3};\ g(x)=x^2$

	FORMULAS →	DOMAIN
f(x) Domain:	$f/g\ :$	
g(x) Domain:	$g/f\ :$	

6. $f(x)=\sqrt{x-2};\ g(x)=\sqrt{x+4}$

	FORMULAS →	DOMAIN
f(x) Domain:	f/g :	
g(x) Domain:	g/f :	

In Exercise 9, find $(f \circ g)(3)$ *and* $(g \circ f)(-2)$

9. $f(x)=2x-3;\ g(x)=x+1$

a. $(f \circ g)(3)=$

b. $(g \circ f)(-2)=$

In Exercises 11-13, find $f(g(x))$ *and* $g(f(x))$. Then, state the **domain of each.**

11. $f(x)=3x+2;\ g(x)=x-1$

a. $(f(g(x))=$

b. $(g(f(x))=$

Domain: _______________

Domain: _______________

13. $f(x)=x^2-2;\ g(x)=\sqrt{x+1}$

a. $(f(g(x))=$

b. $(g(f(x))=$

Domain: _______________

Domain: _______________

In Exercises 15-19, find an expression for $f(x)$ *and* $g(x)$ so that the function can be described as $y=f(g(x))$. Show your work to verify that $y=f(g(x))$ for the $f(x)$ *and* $g(x)$ that you have selected.

15. $y=\sqrt{x^2-5x}$

17. $y=|3x-2|$

19. $y=(x-3)^5+2$