Name: _____ Date: _____

Irrational Numbers
Homework

1. For each of the following rational numbers, use your calculator to write out either the terminating decimal or the repeating decimal patterns.

(a) $\frac{3}{4}$ R .75 (b) $\frac{4}{9}$ R .44444 (c) $\frac{5}{8}$ R .625 (d) $\frac{5}{6}$ R .833333

(e) $\sqrt{\frac{25}{4}}$ (f) $\sqrt{\frac{1}{100}}$ (g) $\sqrt{\frac{4}{9}}$ (h) $\sqrt{\frac{2}{32}}$

2. One of the most famous **irrational numbers** is the number pi, π, which is essential in calculating the circumference and area of a circle.

(a) Use your calculator to write out all of the decimals your calculator gives you for π. Notice no repeating pattern.

(b) Historically the rational number $\frac{22}{7}$ has been used to **approximate** the value of π. Use your calculator to write out all of the decimals for this rational number and compare it to (a).

1
4
9
16
25
36
49
64
81
100

3. For each of the following irrational numbers, do two things: (1) write the square root in simplest radical form and then (2) use your calculator to write out the decimal representation.

(a) $\sqrt{32}$ → I
$\sqrt{16}\sqrt{2}$
$4\sqrt{2}$
R • I = I

(b) $\sqrt{98}$ → I
$\sqrt{49}\sqrt{2}$
$7\sqrt{2}$

(c) $\sqrt{75}$

(d) $\sqrt{500}$
R + I = I

(e) $\sqrt{80}$
$\sqrt{16}\sqrt{5}$
$4\sqrt{5}$

(f) $\sqrt{117}$

Types of numbers mix and match in various ways. The last exercise shows us a trend that we explored during the lesson.

4. Fill in the statement below based on the last exercise with one of the words below the blank.

   The product of a (non-zero) rational number and an irrational number results in a(n) _____ number.
   rational irrational

Now we will explore other patterns in the following exercises.

5. Let's explore the **product** of **two irrational numbers** to see if it is **always irrational, sometimes irrational, sometimes rational,** or **always rational.** Find each product below using your calculator (be careful as you put it in) and write out all decimals. Then, classify as either rational or irrational.

   (a) $\sqrt{5}\cdot\sqrt{3}=$ _____ Rational or irrational?

   (b) $\sqrt{8}\cdot\sqrt{18}=$ _____ Rational or irrational?

   (c) $\sqrt{7}\cdot\sqrt{11}=$ _____ Rational or irrational?

   (d) $\sqrt{11}\cdot\sqrt{11}=$ _____ Rational or irrational?

6. Based on #5, classify the following statement as true or false:

   Statement: The product of two irrational number is always irrational. True or False

7. Let's explore adding rational numbers. Using what you learned about in middle school, add each of the following pairs of rational numbers by first finding a **common denominator** then combine. Then, determine their repeating or terminating decimal.

   (a) $\frac{1}{2}+\frac{2}{3}=$ (b) $\frac{3}{4}+\frac{1}{2}=$ (c) $\frac{3}{8}+\frac{5}{12}=$

   (d) Classify the following statement as true or false:

   Statement: The sum of two rational numbers is always rational. True or False

8. Finally, what happens when we add a rational and an irrational number (we explored this in Exercises #4 through #6 in the lesson). Fill in the blank below from what you learned in class.

   The sum of a rational number with an irrational number will always give a(n) _____ number.
   rational irrational

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SQUARE ROOT FUNCTIONS AND SHIFTING

***Exercise* #1:** Consider $f(x)=\sqrt{x}$.

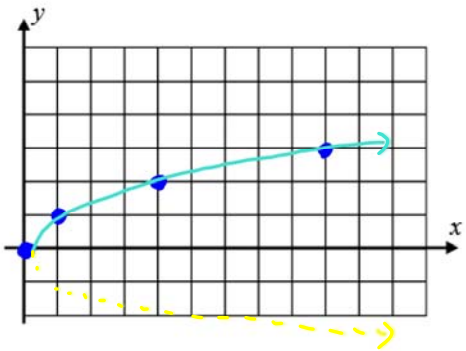
$\sqrt{4} = \pm 2$

(a) Create a table of values for input values of x for which you can find rational square roots.

D → x
R → y

x	0	1	4	9
$f(x)=\sqrt{x}$	0	1	2	3

(b) Graph the function on the grid provided.



(c) What is the domain of this function?

$[0, \infty)$ OR $x \geq 0$

(d) What is the range of this function?

$[0, \infty)$ OR $y \geq 0$

(e) Circle the correct choice below that characterizes $f(x)=\sqrt{x}$.

$f(x)$ is always decreasing

$f(x)$ is always increasing

(f) What shape does the square root graph appear to be "half" of? **This is not a coincidence.**

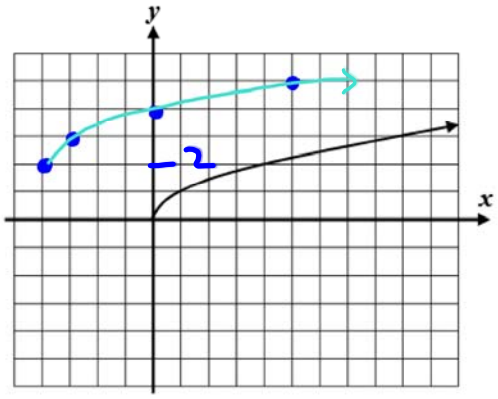
PARABOLA

Now! Square root graphs can be shifted just as quadratics can. And they shift in much the same way.

***Exercise* #2:** The graph of $y=\sqrt{x}$ is shown below.

(a) Using your calculator, graph the function given by $y=\sqrt{x+4}+2$. Show your table of values.

x	-4	-3	0	5
y	2	3	4	5



(b) State the domain and range of this function.

Domain: $[-4, \infty)$

Range: $[2, \infty)$

Where did the square root function move?

LEFT 4, UP 2

$y = (x-2)^2 + 4$

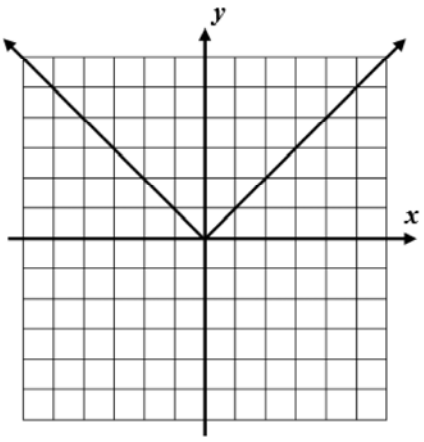
vertex: (2, 4)

$y = \sqrt{x-6} - 10$

$y = \sqrt{x+2} - 4$

OPP. SAME

***Exercise* #3:** The graph of $y = |x|$ is shown on the grid below.



(a) Use your calculator to create a graph of $y = |x+3| - 2$.

(b) State the domain and range of this function:

Domain: Range:

(c) Let's see if you get the pattern. Sketch $y = |x-2| - 1$ without using your calculator.

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SQUARE ROOT FUNCTIONS AND SHIFTING HOMEWORK

1. Given the function $f(x)=\sqrt{x-8}+3$, which of the following is the value of $f(24)$?

   (1) 7 (3) 3

   (2) 11 (4) 4

2. If $g(x)=4\sqrt{x}$ then $g(45)$ is

   (1) $7\sqrt{5}$ (3) $36\sqrt{5}$

   (2) $12\sqrt{5}$ (4) $22\sqrt{5}$

*3. Which of the following values of x is *not* in the domain of $y=\sqrt{x-8}$? Remember, the domain is the set of all inputs (x-values) that give a real output (y-value)?

   (1) $x=12$ (3) $x=8$

   (2) $x=10$ (4) $x=7$

4. Which of the following is the equation of the square root graph shown below?

   (1) $y=\sqrt{x+4}+1$

   (2) $y=\sqrt{x+4}-1$

   (3) $y=\sqrt{x-4}-1$

   (4) $y=\sqrt{x-4}+1$