

# Station #1

I am able to evaluate expressions with rational exponents.

I am able to approximate roots with a calculator.

I am able to solve equations using  $n^{\text{th}}$  roots.

Rewrite the expression using rational exponent notation.

1.  $(\sqrt[3]{63})^3$

2.  $(\sqrt[3]{-25})^4$

3.  $(\sqrt[5]{124})^7$

Rewrite the expression using radical notation.

4.  $(-57)^{4/3}$

5.  $13^{3/2}$

6.  $204^{5/8}$

Evaluate the expression without using a calculator.

7.  $36^{3/2}$

8.  $(\sqrt[4]{256})^3$

9.  $(-125)^{-5/3}$

10.  $(\sqrt[3]{-64})^2$

11.  $(25)^{-3/2}$

12.  $(16)^{1/4}$

Evaluate the expression using a calculator. Round the result to two decimal places.

13.  $(\sqrt[3]{23})^5$

14.  $(-128)^{-2/5}$

15.  $(\sqrt[5]{-124})^4$

16.  $(215)^{-4/9}$

17.  $(256)^{5/8}$

18.  $(39)^{4/3}$

Solve the equation. Round the result to two decimal places.

19.  $x^5 = 1321$

20.  $3x^5 + 3 = 213$

21.  $(x - 3)^6 = 502$

22.  $-4x^3 = 132$

23.  $2x^4 = 36$

24.  $(3x + 2)^4 = 232$

25.  $7 - x^5 = 3$

26.  $4x^5 + 96 = 24$

27.  $12 - (2x + 3)^3 = 84$

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I am able to evaluate expressions with rational exponents.

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I am able to solve equations using  $n^{\text{th}}$  roots.

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1.  $(\sqrt[3]{63})^3$   $63^{3/3}$

2.  $(\sqrt[4]{-25})^4$   $-25^{4/4}$

3.  $(\sqrt[6]{124})^7$   $124^{7/6}$

Rewrite the expression using radical notation.

4.  $(-57)^{4/3}$   $(\sqrt[3]{-57})^4$

5.  $13^{3/2}$   $(\sqrt{13})^3$

6.  $204^{5/8}$   $(\sqrt[8]{204})^5$

Evaluate the expression without using a calculator.

7.  $36^{3/2}$  216

8.  $(\sqrt[4]{256})^3$  64

9.  $(-125)^{-5/3}$   $\frac{1}{3125}$

10.  $(\sqrt[3]{-64})^2$  16

11.  $(25)^{-3/2}$   $\frac{1}{125}$

12.  $(16)^{1/4}$  2

Evaluate the expression using a calculator. Round the result to two decimal places.

13.  $(\sqrt[3]{23})^5$  186.01

14.  $(-128)^{-2/5}$  -0.14

15.  $(\sqrt[5]{-124})^4$  -47.29

16.  $(215)^{-4/9}$  0.09

17.  $(256)^{5/8}$  32

18.  $(39)^{4/3}$  132.26

Solve the equation. Round the result to two decimal places.

19.  $x^5 = 1321$  4.21

20.  $3x^5 + 3 = 213$  2.34

21.  $(x - 3)^6 = 502$   
5.82 & 1.18

22.  $-4x^3 = 132$  -3.21

23.  $2x^4 = 36$  ±2.06

24.  $(3x + 2)^4 = 232$   
6.3 & -1.97

25.  $7 - x^5 = 3$  1.32

26.  $4x^5 + 96 = 24$  -1.78

27.  $12 - (2x + 3)^3 = 84$   
-3.58

## Station #2

I am able to simplify expressions involving rational exponents.  
I am able to use the product and quotient properties of radicals.

Simplify the expression. Assume all variables are positive.

1.  $7^{-3/2}$

2.  $(4 \cdot 3)^{2/3}$

3.  $((7^{2/3})^{3/5})^3$

4.  $(3^{2/3})^{5/2}$

5.  $\frac{9^{3/5}}{9^{2/5}}$

6.  $(\frac{5}{4})^{1/6}$

7.  $(\frac{5^2}{5^{3/2}})^{-1/3}$

8.  $(3^{3/2} \cdot 3^3)^{1/3}$

9.  $(4^{2/3} \cdot 5^{3/4})^3$

Simplify the expression using the properties of radicals.

10.  $\sqrt{5} \cdot \sqrt{2}$

11.  $\frac{\sqrt{10} \cdot \sqrt{21}}{\sqrt{15}}$

12.  $\sqrt[3]{14} \cdot \sqrt[3]{196}$

13.  $\sqrt[4]{5} \cdot \sqrt[4]{2000}$

14.  $\frac{\sqrt{4}}{\sqrt{9}}$

15.  $\frac{\sqrt{27}}{\sqrt{3}}$

## Station #2

I am able to simplify expressions involving rational exponents.  
I am able to use the product and quotient properties of radicals.

Simplify the expression. Assume all variables are positive.

1.  $7^{-3/2}$   $\frac{1}{7^{3/2}}$

2.  $(4 \cdot 3)^{2/3}$   $4^{2/3} \cdot 3^{2/3}$

3.  $((7^{2/3})^{3/5})^3$   $7^{6/5}$

4.  $(3^{2/3})^{5/2}$   $3^{10/6} = 3^{5/3}$

5.  $\frac{9^{3/5}}{9^{2/5}}$   $9^{1/5}$

6.  $(\frac{5}{4})^{1/6}$   $\frac{5^{1/6}}{4^{1/6}}$

7.  $(\frac{5^2}{5^{7/2}})^{-1/3}$   $5^{1/2}$

8.  $(3^{3/2} \cdot 3^3)^{1/3}$   $3^{3/2}$

9.  $(4^{2/3} \cdot 5^{3/4})^3$   $16 \cdot 5^{9/4}$

Simplify the expression using the properties of radicals.

10.  $\sqrt{5} \cdot \sqrt{2}$   $\sqrt{10}$

11.  $\frac{\sqrt{10} \cdot \sqrt{21}}{\sqrt{15}}$   $\sqrt{14}$

12.  $\sqrt[3]{14} \cdot \sqrt[3]{196}$   
14

13.  $\sqrt[4]{5} \cdot \sqrt[4]{2000}$  10

14.  $\frac{\sqrt{4}}{\sqrt{9}}$   $\frac{2}{3}$

15.  $\frac{\sqrt{27}}{\sqrt{3}}$  3

## Station #3

I am able to write radicals in simplest form.

I am able to add and subtract like radicals and variable expressions.

Write the expression in simplest form. Assume all variables are positive.

1.  $\sqrt{64x^3}$

2.  $\sqrt{\frac{x^3}{x^4}}$

3.  $\left(\frac{16^{1/3}}{2^{1/3}}\right)^2$

4.  $\left(\frac{2x^3y^{2/3}}{x^{5/3}y^{3/5}z}\right)^3$

5.  $\sqrt{xy^2z^3} + \sqrt{9xy^2z^3}$

6.  $\left(\frac{x^{1/4}}{x^{1/2}}\right)^{-1}$

7.  $\sqrt[3]{8x^3y^6z^4}$

8.  $\frac{x^{4/3}y^{7/6}}{xy}$

9.  $\sqrt[4]{\frac{x^{17}}{y^8}}$

Perform the indicated operation. Assume all variables are positive.

10.  $\sqrt{5} + 3\sqrt{5}$

11.  $2\sqrt{27} + 4\sqrt{75}$

12.  $-4\sqrt[4]{x} - 6\sqrt[4]{x}$

13.  $7\sqrt{5} - 2\sqrt{20}$

14.  $6\sqrt{7} - 3\sqrt{7}$

15.  $2\sqrt[5]{13} + 5\sqrt[5]{13}$

16.  $3\sqrt{x} - 8\sqrt{x}$

17.  $5\sqrt[3]{x} + 2\sqrt[3]{x}$

18.  $\sqrt[3]{16} + \sqrt[3]{54}$

## Station #3

I am able to write radicals in simplest form.  
I am able to add and subtract like radicals and variable expressions.

Write the expression in simplest form. Assume all variables are positive.

1.  $\sqrt{64x^3}$   $8x\sqrt{x}$

2.  $\sqrt{\frac{x^3}{x^4}}$   $\frac{\sqrt{x}}{x}$

3.  $\left(\frac{16^{1/3}}{2^{1/3}}\right)^2$   $4$

4.  $\left(\frac{2x^3y^{2/3}}{x^{5/3}y^{3/5}z}\right)^3$   $\frac{8x^9y^{15}}{z^3}$

5.  $\sqrt{xy^2z^3} + \sqrt{9xy^2z^3}$   
 $4yz\sqrt{xz}$

6.  $\left(\frac{x^{1/4}}{x^{1/2}}\right)^{-1}$   $x^{1/4}$

7.  $\sqrt[3]{8x^3y^6z^4}$   
 $2xy^2z\sqrt[3]{z}$

8.  $\frac{x^{4/3}y^{7/6}}{xy}$   $x^{1/3}y^{1/6}$

9.  $\sqrt[4]{\frac{x^{17}}{y^8}}$   $\frac{x^4\sqrt[4]{x}}{y^2}$

Perform the indicated operation. Assume all variables are positive.

10.  $\sqrt{5} + 3\sqrt{5}$   $4\sqrt{5}$

11.  $2\sqrt{27} + 4\sqrt{75}$   $26\sqrt{3}$

12.  $-4\sqrt[4]{x} - 6\sqrt[4]{x}$   
 $-10\sqrt[4]{x}$

13.  $7\sqrt{5} - 2\sqrt{20}$   $3\sqrt{5}$

14.  $6\sqrt{7} - 3\sqrt{7}$   $3\sqrt{7}$

15.  $2\sqrt[5]{13} + 5\sqrt[5]{13}$   
 $7\sqrt[5]{13}$

16.  $3\sqrt{x} - 8\sqrt{x}$   
 $-5\sqrt{x}$

17.  $5\sqrt[3]{x} + 2\sqrt[3]{x}$   
 $7\sqrt[3]{x}$

18.  $\sqrt[3]{16} + \sqrt[3]{54}$   
 $5\sqrt[3]{2}$

## Station #4

I am able to perform the operations addition, subtraction, multiplication, and division with functions.

I am able to find the composition of functions.

I am able to identify a power function.

Let  $f(x) = 7x^{1/2} - 2$ ,  $g(x) = -x^{1/2}$ , and  $h(x) = -4x^{1/2} + 1$ . Perform the indicated operation. State the domain.

1.  $f(x) + g(x)$

2.  $h(x) - f(x)$

3.  $h(x) + g(x)$

4.  $g(x) - h(x)$

5.  $f(x) - g(x)$

6.  $f(x) + h(x)$

Let  $f(x) = 4x^2$ ,  $g(x) = -3x^{4/3}$ , and  $h(x) = x^{1/2}$ . Perform the indicated operation. State the domain.

7.  $h(x) \cdot g(x)$

8.  $f(x) \cdot h(x)$

9.  $\frac{h(x)}{g(x)}$

10.  $\frac{f(x)}{g(x)}$

11.  $\frac{h(x)}{f(x)}$

12.  $f(x) \cdot g(x)$

Let  $f(x) = 2x + 3$ ,  $g(x) = \frac{3}{x+1}$ , and  $h(x) = \frac{x+5}{2}$ . Perform the indicated operation. State the domain.

13.  $f(h(x))$

14.  $g(h(x))$

15.  $g(f(x))$

16.  $h(f(x))$

17.  $f(g(x))$

18.  $g(g(x))$

## Station #4

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Let  $f(x) = 7x^{1/2} - 2$ ,  $g(x) = -x^{1/2}$ , and  $h(x) = -4x^{1/2} + 1$ . Perform the indicated operation. State the domain.

Domain:  $[0, \infty)$   
on all

1.  $f(x) + g(x)$   
 $6x^{1/2} - 2$

2.  $h(x) - f(x)$   
 $-11x^{1/2} - 1$

3.  $h(x) + g(x)$   
 $-5x^{1/2} + 1$

4.  $g(x) - h(x)$   
 $3x^{1/2} - 1$

5.  $f(x) - g(x)$   
 $8x^{1/2} - 2$

6.  $f(x) + h(x)$   
 $3x^{1/2} - 1$

Let  $f(x) = 4x^2$ ,  $g(x) = -3x^{4/3}$ , and  $h(x) = x^{1/2}$ . Perform the indicated operation. State the domain.

7.  $h(x) \cdot g(x)$   $-3x^{11/6}$   
 $[0, \infty)$

8.  $f(x) \cdot h(x)$   $4x^{5/2}$   
 $[0, \infty)$

9.  $\frac{h(x)}{g(x)}$   $-\frac{1}{3x^{5/6}}$   $(0, \infty)$

10.  $\frac{f(x)}{g(x)}$   $-\frac{4x^{2/3}}{3}$   $\mathbb{R}$

11.  $\frac{h(x)}{f(x)}$   $\frac{1}{4x^{3/2}}$   $(0, \infty)$

12.  $f(x) \cdot g(x)$   $-12x^{10/3}$   
 $\mathbb{R}$

Let  $f(x) = 2x + 3$ ,  $g(x) = \frac{3}{x+1}$ , and  $h(x) = \frac{x+5}{2}$ . Perform the indicated operation. State the domain.

13.  $f(h(x))$   $x+8$   $\mathbb{R}$

14.  $g(h(x))$   $\frac{6}{x+7}$   $\mathbb{R}$  except  $x = -7$

15.  $g(f(x))$   $\frac{3}{2x+4}$   $\mathbb{R}$  except  $x = -2$

16.  $h(f(x))$   $x+4$   
 $\mathbb{R}$

17.  $f(g(x))$   $\frac{3x+9}{x+1}$   $\mathbb{R}$  except  $x = -1$

18.  $g(g(x))$   $\frac{3x+3}{x+4}$   
 $\mathbb{R}$  except  $x = -4$



## Station #5

I am able to find an inverse function.

I am able to verify that functions are inverses.

I am able to find an inverse of non-linear functions.

Find an equation for the inverse relation.

1.  $y = \frac{1}{3}x$

2.  $y = 6x - 3$

3.  $y = 2x + 1$

4.  $y = \frac{1}{2} - \frac{2}{3}x$

5.  $y = x^2 + 2$

6.  $y = -4x + 6$

Verify that f and g are inverse functions.

7.  $f(x) = x + 4; g(x) = x - 4$

8.  $f(x) = 3 - x; g(x) = 3 - x$

9.  $f(x) = \frac{1}{3}x^3 - 2; g(x) = \sqrt[3]{3x} + 6$

10.  $f(x) = \frac{3-x}{x-2}; g(x) = \frac{3}{x+1}$

11.  $f(x) = 3x + 5; g(x) = \frac{1}{3}x - \frac{5}{3}$

12.  $f(x) = x^5; g(x) = \sqrt[5]{x}$

Graph the function to determine whether the inverse of the function is a function.

13.  $f(x) = 2x + 1$

14.  $f(x) = -x^2 + 3, x \geq 0$

15.  $f(x) = -x - 2$

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

17.  $f(x) = \frac{1}{4}x^3$

18.  $f(x) = |x| + 1$

Find the inverse of the function.

19.  $f(x) = 4x^2 + 1, x \geq 0$

20.  $f(x) = \sqrt{2x + 5}$

21.  $f(x) = \frac{4-x}{3x}$

22.  $f(x) = 4x^7$

23.  $f(x) = \sqrt[5]{5x + 4}$

24.  $f(x) = \sqrt{x - 3}$

# Station #5

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I am able to verify that functions are inverses.

I am able to find an inverse of non-linear functions.

Find an equation for the inverse relation.

1.  $y = \frac{1}{3}x$       $y = 3x$

2.  $y = 6x - 3$       $y = \frac{1}{6}x + \frac{1}{2}$

3.  $y = 2x + 1$       $y = \frac{1}{2}x - \frac{1}{2}$

4.  $y = \frac{1}{2} - \frac{2}{3}x$       $y = \frac{3}{4} - \frac{3}{2}x$

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

6.  $y = -4x + 6$       $y = \frac{3}{2} - \frac{1}{4}x$

Verify that f and g are inverse functions.

Show that  $f(g(x)) = x$  &  $g(f(x)) = x$

7.  $f(x) = x + 4; g(x) = x - 4$

8.  $f(x) = 3 - x; g(x) = 3 - x$

9.  $f(x) = \frac{1}{3}x^3 - 2; g(x) = \sqrt[3]{3x + 6}$

10.  $f(x) = \frac{3-x}{x-2}; g(x) = \frac{3}{x+1}$

11.  $f(x) = 3x + 5; g(x) = \frac{1}{3}x - \frac{5}{3}$

12.  $f(x) = x^5; g(x) = \sqrt[5]{x}$

Graph the function to determine whether the inverse of the function is a function.

13.  $f(x) = 2x + 1$      Yes!

14.  $f(x) = -x^2 + 3, x \geq 0$   
Yes!

15.  $f(x) = -x - 2$   
Yes!

16.  $f(x) = \frac{1}{2}x^2 - 1$      No!

17.  $f(x) = \frac{1}{4}x^3$      Yes!

18.  $f(x) = |x| + 1$   
No!

Find the inverse of the function.

19.  $f(x) = 4x^2 + 1, x \geq 0$

$f^{-1}(x) = \sqrt{\frac{x-1}{4}}$

20.  $f(x) = \sqrt{2x + 5}$

$f^{-1}(x) = \frac{1}{2}x^2 - \frac{5}{2}$

21.  $f(x) = \frac{4-x}{3x}$

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

22.  $f(x) = 4x^7$

$f^{-1}(x) = \sqrt[7]{\frac{x}{4}}$

23.  $f(x) = \sqrt[5]{5x + 4}$

$f^{-1}(x) = \frac{1}{5}x^5 - \frac{4}{5}$

24.  $f(x) = \sqrt{x-3}$

$f^{-1}(x) = x^2 + 3$

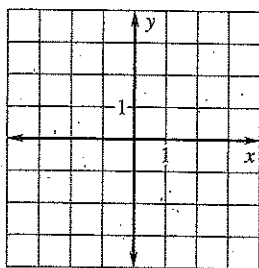
# Station #6

I am able to graph radical functions such as square root and cube root.

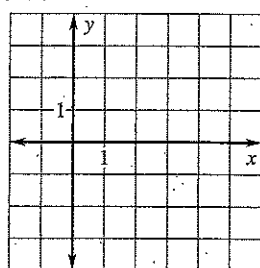
I am able to graph a translated root function.

Graph the function. Then state the domain and range. Compare the graph to the parent function.

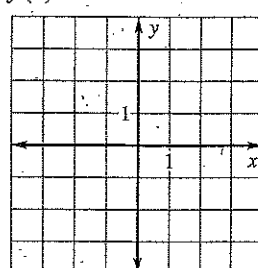
1.  $f(x) = \sqrt{x} - 2$



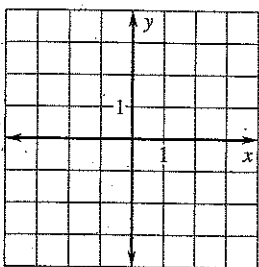
2.  $f(x) = \sqrt{x-2}$



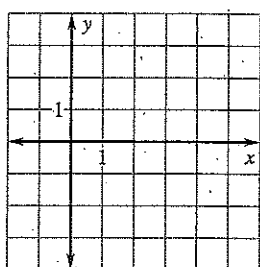
3.  $f(x) = 3\sqrt{x+1}$



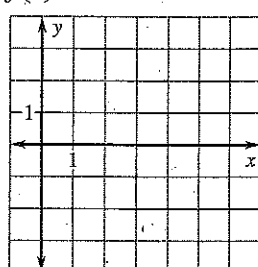
4.  $f(x) = \sqrt{x+2} - 2$



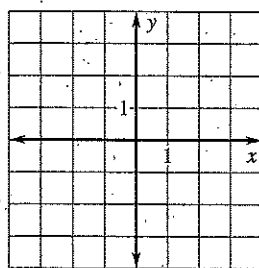
5.  $f(x) = \sqrt{x-1} + 1$



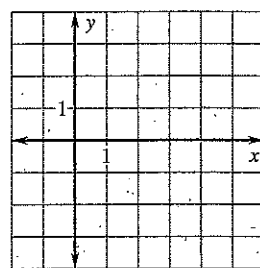
6.  $f(x) = -\sqrt{x-3}$



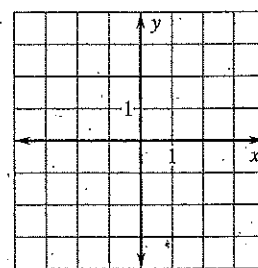
7.  $f(x) = \sqrt[3]{x} + 1$



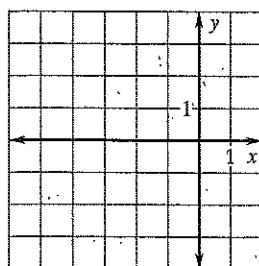
8.  $f(x) = \sqrt[3]{x-4}$



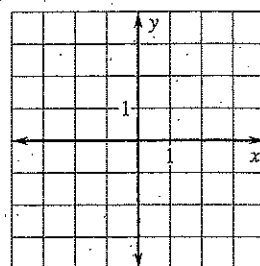
9.  $f(x) = 3\sqrt[3]{x}$



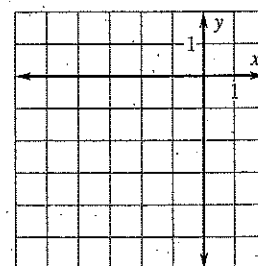
10.  $f(x) = \sqrt[3]{x+2}$



11.  $f(x) = -\sqrt[3]{x} - 1$



12.  $f(x) = \sqrt[3]{x+2} - 2$



# Station #6

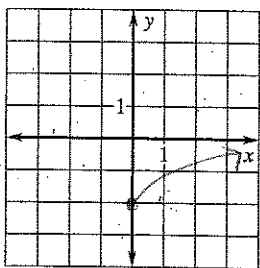
I am able to graph radical functions such as square root and cube root.

I am able to graph a translated root function.

Graph the function. Then state the domain and range. Compare the graph to the parent function.

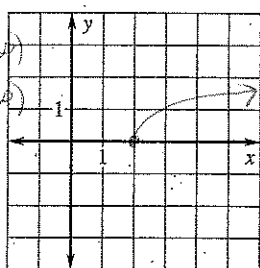
1.  $f(x) = \sqrt{x} - 2$

$D: [0, \infty)$   
 $R: [-2, \infty)$



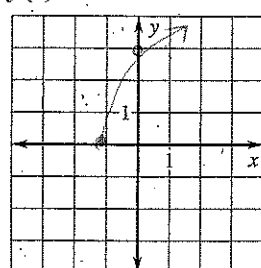
2.  $f(x) = \sqrt{x-2}$

$D: [2, \infty)$   
 $R: [0, \infty)$



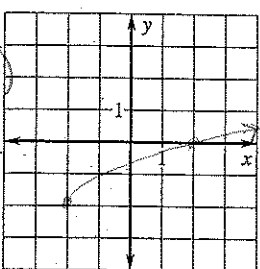
3.  $f(x) = 3\sqrt{x+1}$

$D: [-1, \infty)$   
 $R: [0, \infty)$



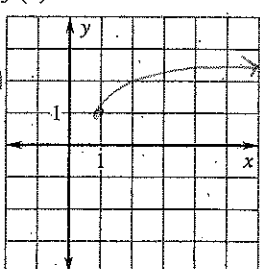
4.  $f(x) = \sqrt{x+2} - 2$

$D: [-2, \infty)$   
 $R: [-2, \infty)$



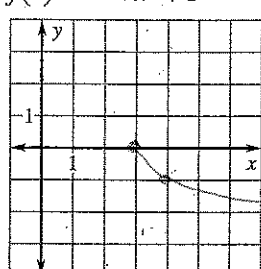
5.  $f(x) = \sqrt{x-1} + 1$

$D: [1, \infty)$   
 $R: [1, \infty)$



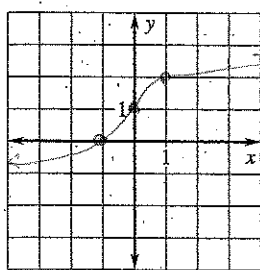
6.  $f(x) = -\sqrt{x-3}$

$D: [3, \infty)$   
 $R: [0, -\infty)$



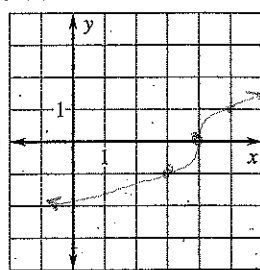
7.  $f(x) = \sqrt[3]{x} + 1$

$D: \mathbb{R}$   
 $R: \mathbb{R}$   
 $(-\infty, \infty)$



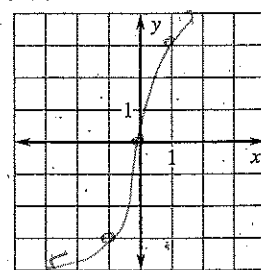
8.  $f(x) = \sqrt[3]{x-4}$

$D: \mathbb{R}$   
 $R: \mathbb{R}$   
 $(-\infty, \infty)$



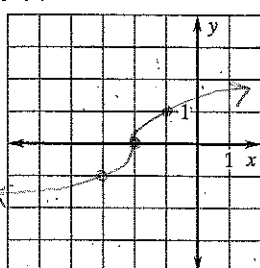
9.  $f(x) = 3\sqrt[3]{x}$

$D: \mathbb{R}$   
 $R: \mathbb{R}$   
 $(-\infty, \infty)$



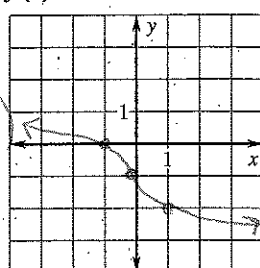
10.  $f(x) = \sqrt[3]{x+2}$

$D: \mathbb{R}$   
 $R: \mathbb{R}$   
 $(-\infty, \infty)$



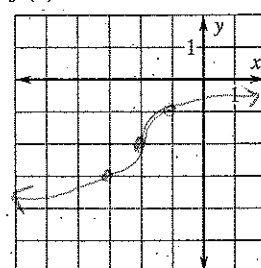
11.  $f(x) = -\sqrt[3]{x} - 1$

$D: \mathbb{R}$   
 $R: \mathbb{R}$   
 $(-\infty, \infty)$



12.  $f(x) = \sqrt[3]{x+2} - 2$

$D: \mathbb{R}$   
 $R: \mathbb{R}$   
 $(-\infty, \infty)$



## Station #7

I am able to solve radical equations with rational exponents.

I am able to solve radical equations with extraneous solutions.

I am able to solve equations with two radicals.

Solve the equation. Check your solution.

1.  $\sqrt{x+9} = 3 - \sqrt{x}$

2.  $(x+3)^3 + 6 = -21$

3.  $(2x+1)^{1/2} - 2 = 2$

4.  $\sqrt{x^2-9} + 3 = 7$

5.  $\sqrt{x} + 3 = \sqrt{x+4}$

6.  $\sqrt[3]{x^3+3} + 1 = 4$

7.  $\sqrt[5]{8x+11} = \sqrt[5]{5x-4}$

8.  $\sqrt{x-7} = \sqrt{x+1} + 2$

9.  $10 - 3\sqrt[3]{2x+5} = -11$

10.  $\sqrt{2x-6} = \sqrt{5x-15}$

11.  $\frac{1}{2}(x-3)^{3/4} + 6 = 9$

12.  $2(5x^2+10)^{2/3} - 5 = 45$

13.  $(3x^2-2)^{1/2} + 4 = 9$

14.  $9 - \sqrt{x+4} = 4$

15.  $3\sqrt{4-3x} + 5 = 17$

## Station #7

I am able to solve radical equations with rational exponents.

I am able to solve radical equations with extraneous solutions.

I am able to solve equations with two radicals.

Solve the equation. Check your solution.

1.  $\sqrt{x+9} = 3 - \sqrt{x}$

0

2.  $(x+3)^3 + 6 = -21$

-6

3.  $(2x+1)^{1/2} - 2 = 2$

$\frac{15}{2}$

4.  $\sqrt{x^2-9} + 3 = 7$

$\pm 5$

5.  $\sqrt{x+3} = \sqrt{x+4}$

no solution

6.  $\sqrt[3]{x^3+3} + 1 = 4$

$2\sqrt[3]{3}$

7.  $\sqrt[5]{8x+11} = \sqrt[5]{5x-4}$

-5

8.  $\sqrt{x-7} = \sqrt{x+1} + 2$

no solution

9.  $10 - 3\sqrt[3]{2x+5} = -11$

169

10.  $\sqrt{2x-6} = \sqrt{5x-15}$

3

11.  $\frac{1}{2}(x-3)^{3/4} + 6 = 9$

$3 + 6\sqrt[3]{6}$

12.  $2(5x^2+10)^{2/3} - 5 = 45$

$\pm\sqrt{23}$

13.  $(3x^2-2)^{1/2} + 4 = 9$

$\pm 3$

14.  $9 - \sqrt{x+4} = 4$

21

15.  $3\sqrt{4-3x} + 5 = 17$

-4