KEY

L07 – Radical Equations

Part 1 – Key Ideas

Extraneous Roots – A solution to an equation that *appears to be correct*, but when we attempt to verify it, we discover that it does not work.

To identify whether a root is extraneous, substitute the value into the original equation. Raising both sides of an equation to an even exponent may introduce an extraneous root.

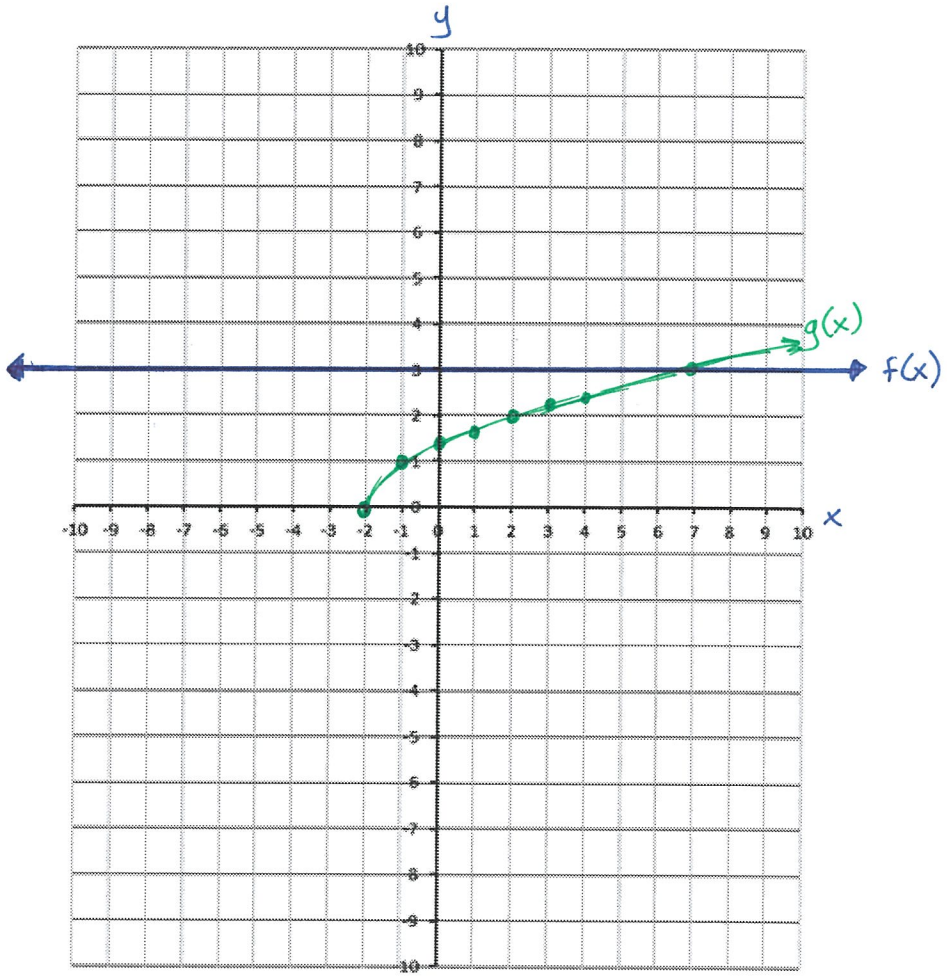
When determining restrictions on the values for variables, remember:

- Denominators cannot be equal to zero.
- For radicals to be real numbers, radicands (the number under the root) must be non-negative if the index is an even number.

Part 2 – Examining Radical Equations in Math 20-2 using Graphing and Algebra

Q1: Consider the equations $f(x) = 3$ and $g(x) = \sqrt{x+2}$.

x	$f(x)$	$g(x)$
-4	3	Undefined
-3	3	Undefined
-2	3	0
-1	3	1
0	3	1.4142
1	3	1.7321
2	3	2
3	3	2.2361
4	3	2.4494
↓		
7	3	3



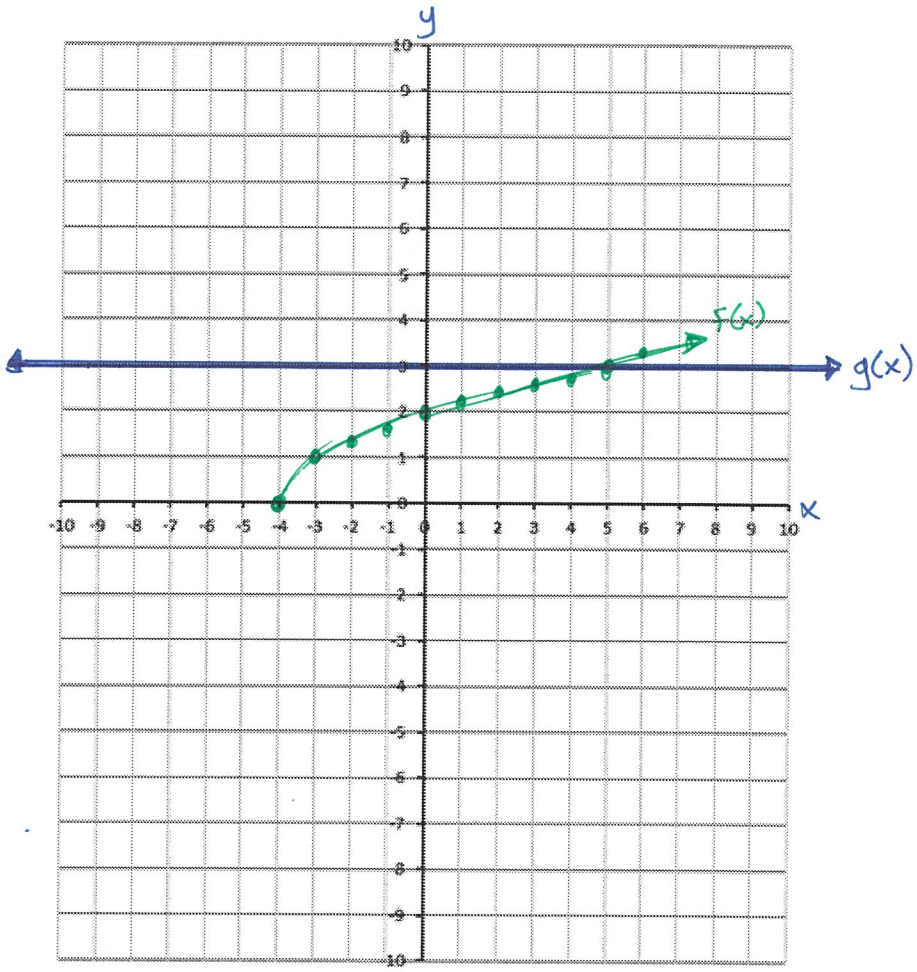
Math 20-2

KEY

Q2: Consider the radical equation $\sqrt{x+4} = 3$ as a system of equations. We can approach the question by graphing $f(x) = \sqrt{x+4}$ and $g(x) = 3$, and look for the solutions to the system.

Create a table of values using your Graphing Calculator.

x	$f(x)$	$g(x)$
-4	0	3
-3	1	3
-2	1.41	3
-1	1.73	3
0	2	3
1	2.24	3
2	2.45	3
3	2.65	3
4	2.83	3
5	3	3
6	3.16	3



Now confirm your answer algebraically.

$\sqrt{x+4} = 3$ Square both sides.

$x+4 = 9$

$-4 \quad -4$

$x = 5$

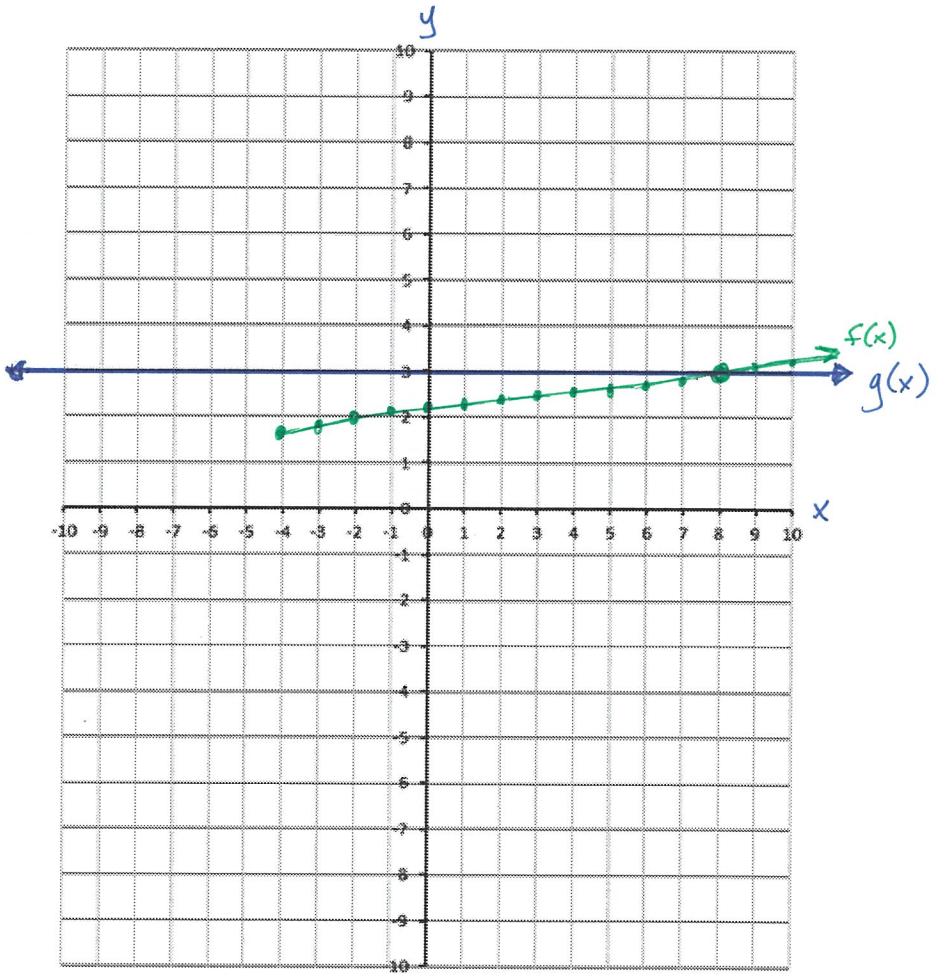
Math 20-2

Key

Q3: Consider the radical equation $\sqrt{\frac{x+10}{2}} = 3$ as a system of equations. We can approach the question by graphing $f(x) = \sqrt{\frac{x+10}{2}}$ and $g(x) = 3$, and look for the solutions to the system.

Create a table of values using your Graphing Calculator.

x	$f(x)$	$g(x)$
-4	1.73	3
-3	1.87	3
-2	2	3
-1	2.12	3
0	2.24	3
1	2.35	3
2	2.45	3
3	2.55	3
4	2.65	3
5	2.74	3
6	2.83	3
7	2.92	3
8	3	3
9	3.08	3
10	3.16	3



Now confirm your answer algebraically.

$\sqrt{\frac{x+10}{2}} = 3$ Square both sides

$\frac{x+10}{2} = 9$

$\cdot 2 \quad \cdot 2$

$x + 10 = 18$

$-10 \quad -10$

$x = 8$

Key

Q4: The equation $\sqrt{5x-4}=2$ can be simplified to $x=\frac{a}{b}$, where ***a*** and ***b*** are ___ and ___.

*(Record your **two-digit** answer in the Numerical Response boxes below)*

8	5		

$\sqrt{5x-4}=2$ Square both sides

$5x-4=4$

$+4 \quad +4$

$5x=8$

$\div 5 \quad \div 5$

$x=\frac{8}{5}$ $x=\frac{a}{b}$

Q5: The equation $\sqrt{2x+3}=6$ can be simplified to $x=\frac{ab}{c}$, where ***a, b,*** and ***c*** are ___, ___, and ___.

*(Record your **three-digit** answer in the Numerical Response boxes below)*

3	3	2	

$\sqrt{2x+3}=6$ Square both sides

$2x+3=36$

$-3 \quad -3$

$2x=33$

$\div 2 \quad \div 2$

$x=\frac{33}{2}$ $x=\frac{ab}{c}$

Q6: Solve the equation $\sqrt{\frac{ax-b}{c}}=d$ for the variable x.

$\sqrt{\frac{ax-b}{c}}=d$ Square both sides

$\frac{ax-b}{c}=d^2$

$\cdot c \quad \cdot c$

$ax-b=cd^2$

$+b \quad +b$

$ax=cd^2+b$

$\div a \quad \div a$

$x=\frac{cd^2+b}{a}$

KEY

Part 3 – Examining Radical Equations in Math 20-1 using Graphing and Algebra

Q7: Solve the radical equation $\sqrt{x+5} = x+3$ and verify your solution(s).

$\sqrt{x+5}^2 = x+3$ Square both sides

$x+5 = (x+3)^2$

$x+5 = (x+3)(x+3)$

$x+5 = x^2+6x+9$

$-1x-5 \quad -1x-5$

$0 = x^2+5x+4$

$0 = (x+1)(x+4)$

$x+1=0$ $\quad x+4=0$

$-1 \ -1 \quad -4 \ -4$

$x=-1 \quad x=-4$

$+1 \ +4$

$\square+\square = 5$

$\square\times\square = 4$

1, 4

2, 2

Q8: Solve the radical equation $\sqrt{-2x+13} = x+1$ and verify your solution(s).

$\sqrt{-2x+13}^2 = x+1$ Square both sides

$-2x+13 = (x+1)^2$

$-2x+13 = (x+1)(x+1)$

$-2x+13 = x^2+2x+1$

$+2x \ -13 \quad +2x \ -13$

$0 = x^2+4x-12$

$0 = (x-2)(x+6)$

$x-2=0$ $\quad x+6=0$

$+2 \ +2 \quad -6 \ -6$

$x=2 \quad x=-6$

$-2 \ +6$

$\square+\square = 4$

$\square\times\square = -12$

1, 12

2, 6

3, 4