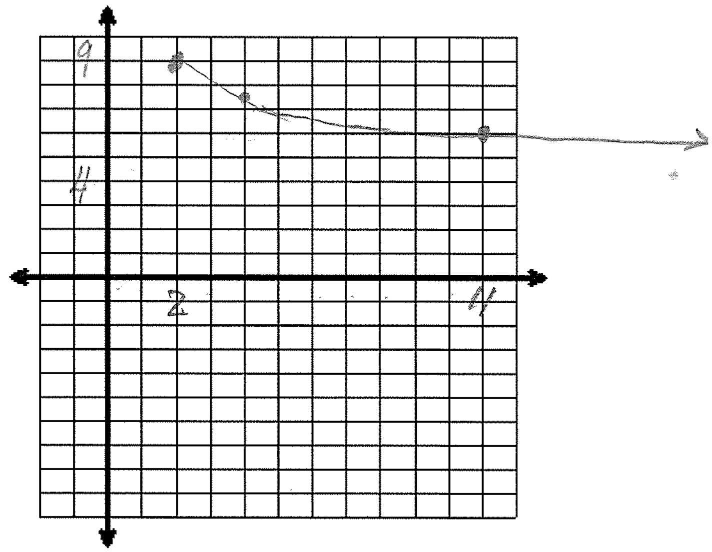
Name: ________________________________ Date: ____________________ Period: _______

Advanced Algebra II Honors: Introduction to Irrational Algebraic Functions

Recall: A ***rational function*** is a ratio of polynomials of the form $R(x)=\dfrac{P(x)}{Q(x)}$, where $P(x)$ and $Q(x)$ stand for polynomials.

New Definition: An ***irrational algebraic function*** *(or irrational function or radical function)* is a function in which the independent variable appears under a radical sign or in a power with a rational number for its exponent.

Given that $f(x)=9-\sqrt{x-2}$



a. Give the domain of x if $f(x)$ is a real number.

$x-2=0$
$x=2$ $\quad$ $D: \{x \geq 2\}$

b. Find $f(27)$.

$f(27)=9-\sqrt{27-2}$
$9-5$
$=4$

c. Find x if $f(x) = 5$ $\quad$ $5=9-\sqrt{x-2}$

$\sqrt{x-2}=4$
$x-2=16$
$x=18$

d. Plot above the graph of $f(x)=9-\sqrt{x-2}$ in the domain $2 \leq x \leq 11$. Make a table of values.

x	y
2	9
11	6

2. If $f(x)=x-2\sqrt{x+3}$

a. Give the domain of x if $f(x)$ is a real number. $\quad$ $x+3 \geq 0$

$D: \{x \geq -3\}$

b. Find x-intercepts

$0=x-2\sqrt{x+3}$ $\quad$ x-intercepts $\{6, -2\}$
$(2\sqrt{x+3})^2=x^2$
$4(x+3)=x^2$
$0=x^2-4x-12$
$(x-6)(x+2)$

c. Find x if $f(x) = -3$ $\quad$ $-3=x-2\sqrt{x+3}$

$2\sqrt{x+3}=x+3$
$4(x+3)=(x+3)^2$
$4x+12=x^2+6x+9$
$0=x^2+2x-3$
$0=(x+3)(x-1)$
$x=-3$ $\quad$ $x=1$

ck:
$-3=-3-2(0)$
$-3=-3$ ✓
$-3=1-2\sqrt{4}$
$=1-4$
$-3=-3$ ✓
$x: \{-3, 1\}$

Your Turn: (same as old text p.414/1-7

1. Given: $f(x) = 3 + \sqrt{x+2}$

$f(-2) = 3$ $\quad$ $f(2) = 5$

$f(-1) = 4$ $\quad$ $f(4) = 3 + \sqrt{6}$

$f(0) = 3 + \sqrt{2}$

   a. Find *f(-2)*, *f(-1)*, *f(0)*, *f(2)*, and *f(4)*.

   b. Try to find *f(-3)* and *f(-6)*. What do you notice?

$f(-3) = 3 + \sqrt{-1} \rightarrow 3 + i$

$f(-6) = 3 + \sqrt{-4} \rightarrow 3 + 2i$

   c. What numbers must be excluded from the domain of function *f*?

$x + 2 \geq 0$

$x \geq -2$

$\boxed{\text{Exclude } x < -2.}$

   d. Plot the graph of *f(x)*.

   e. Find *x* if *f(x)* = 6. You can do this by isolating the radical on one side of the equation, then squaring both sides. Show on the graph your answer is reasonable.

   f. Find *x* if *f(x)* = 1. Show on the graph that the answer you get could not possibly be correct. Why did you get the result that you did.

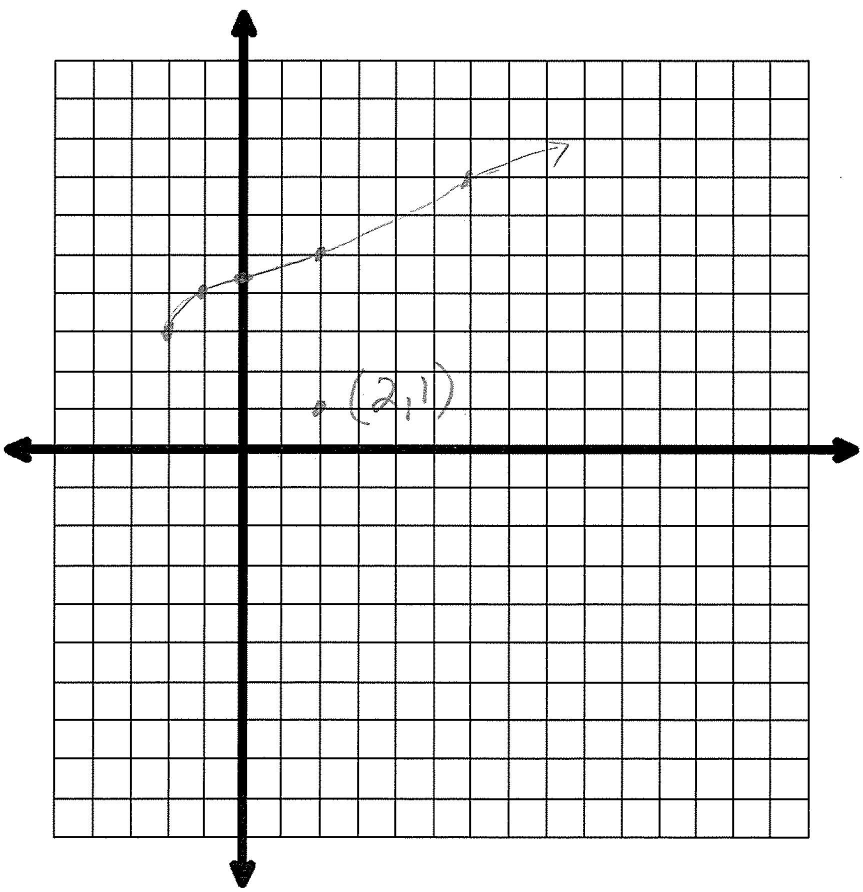
e) $6 = 3 + \sqrt{x+2}$

$3 = \sqrt{x+2}$

$9 = x + 2$

$7 = x$

$(7, 6)$



f) $1 = 3 + \sqrt{x+2}$

$-2 = \sqrt{x+2}$ $\quad$ *

$4 = x + 2$

$2 = x$

(2,1) is not on the graph.

Also, notice step 2 *

Same as old book p. 416(#5)

2. $f(x) = x - 3\sqrt{x+4}$

a. What is the least value of x for which there is a real-number value of $f(x)$? $x+4 \ge 0$ $\{x : x \ge -4\}$

b. Plot the graph using a suitable domain.

c. What does the $f(x)$-intercept equal? $(0, -6)$

d. What does the x-intercept equal? $(12, 0)$

e. Find the two values of x for which $f(x) = -5$ See below.

f. Find the one value of x for which $f(x) = -3$

g. Show that there are no values of x for which $f(x) = -8$

h. $f(x)$ reaches ~~a maximum~~ minimum value somewhere between $x = -4$ and $x = 0$.

~~Approximately what is the value of x?~~ Approximately what is the minimum value?

Min: $(-1.75, -6.25)$

f) $-3 = x - 3\sqrt{x+4}$

$(3\sqrt{x+4})^2 = (x+3)^2$

$9(x+4) = x^2 + 6x + 9$

$0 = x^2 - 3x - 27$

$x = \frac{3}{2} \pm \frac{3\sqrt{13}}{2} \approx \boxed{6.908}$

g) $-8 = x - 3\sqrt{x+4}$

$(3\sqrt{x+4})^2 = (x+8)^2$

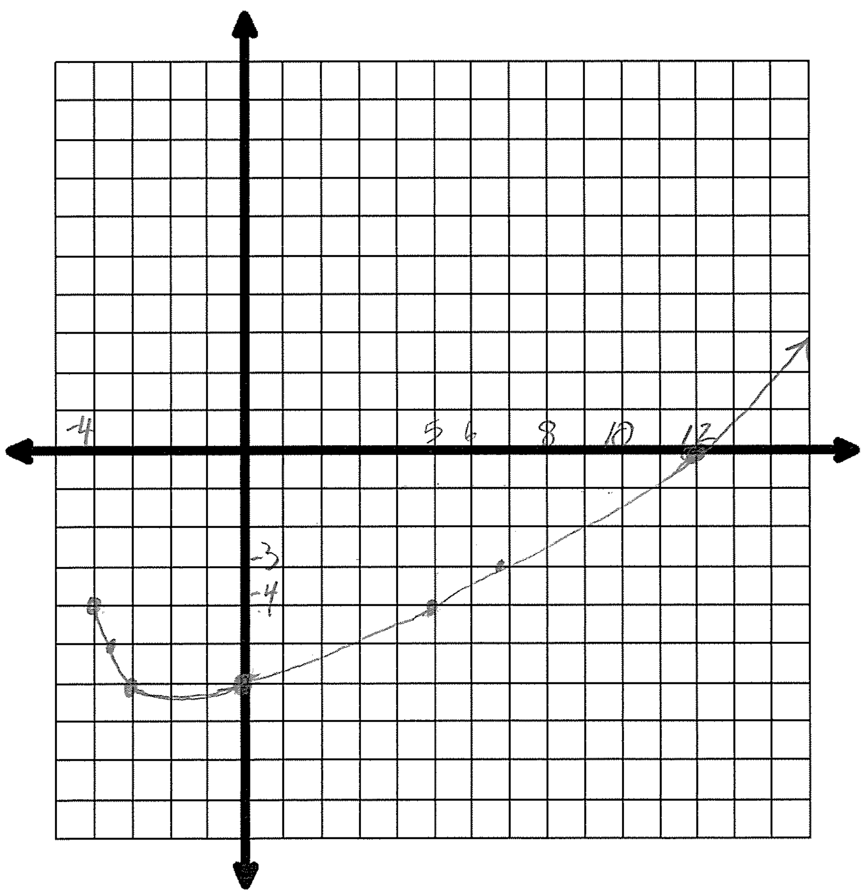
$9(x+4) = x^2 + 16x + 64$

$0 = x^2 + 7x + 28$

$x = \frac{-7 \pm \sqrt{-63}}{2}$

$\boxed{x = \frac{-7 \pm 3i\sqrt{7}}{2}}$

Cannot graph complex # on x-y grid.



x	$f(x)$
-4	-4
-3	-6
0	-6
5	-4
12	0

e) $-5 = x - 3\sqrt{x+4}$

$(3\sqrt{x+4})^2 = (x+5)^2$

$9(x+4) = x^2 + 10x + 25$

$9x + 36 =$

$0 = x^2 + x - 11$

$x = -\frac{1}{2} \pm \frac{3\sqrt{5}}{2}$ ≈ 2.85, ≈ -3.85