Name: _____ Date: _____ Hour: ____Alg 1____

Unit 7B Day 14: Solving quadratics in vertex form

Focus Question: How do I solve a quadratic in vertex form? (Good news, you've already done this mostly!)

A. Solutions.

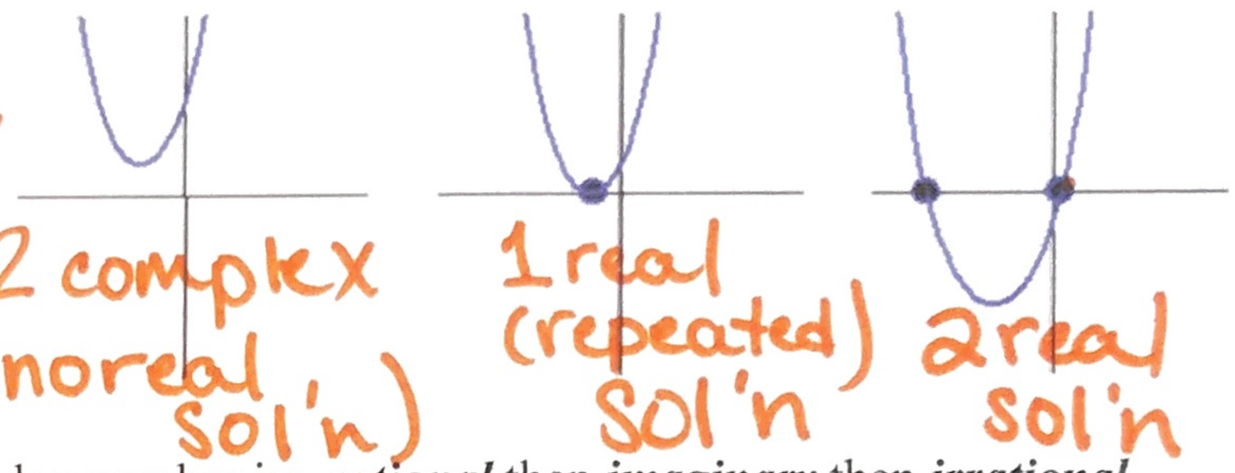
1. What are other synonyms for "solve" or solutions when referring to a quadratic?

roots, zeros, x-int.

2. The graph of a quadratic function can have 0, 1, or 2 x intercepts. Why can it have up to two, but no more than 2 x-intercepts?

Fund. Thm. of alg. degree 2 quad.

3. For each graph at right, give the number and type of solutions the quadratic has.



2 complex (no real sol'n) | 1 real (repeated) sol'n | 2 real sol'n

4. The correct order to write a monomial complex number is: ***rational*** then ***imaginary*** then ***irrational***
Write the following numbers in the correct order

a. $\sqrt{47}i4$ — $4i\sqrt{47}$

b. $i\sqrt{238}$ — $8i\sqrt{23}$

c. $3\sqrt{2}i$ — $3i\sqrt{2}$

5. The correct order to write a binomial complex numbers is: ***real term*** then ***imaginary term***
Correctly write the following complex numbers

a. $i\sqrt{6}+5$ — $5+i\sqrt{6}$

b. $7i-\sqrt{2}$ — $-\sqrt{2}+7i$

c. $-2i+4$ — $4-2i$

B. Solving a Quadratic in Vertex Form:

1. What is the order of operations? PEMDAS

2. How are these relevant when solving an equation? go in reverse

3. But we don't have an equation, we have a function $f(x)=a(x-h)^2+k$. So, what equation do we make? Why? f(x)=0 finding zeros x-ints $0=a(x-h)^2+k$

4. Solve the following quadratics. For each one give its number/type of solutions, sketch a graph, and give its range.

$g(x)=\frac{1}{4}(x+5)^2+2$

$0=\frac{1}{4}(x+5)^2+2$

$-2 \quad -2$

$-2=\frac{1}{4}(x+5)^2$

$\cdot 4 \quad \cdot 4$

$-8=(x+5)^2$

$\sqrt{-8}=\sqrt{(x+5)^2}$

$x+5=\sqrt{-8}$

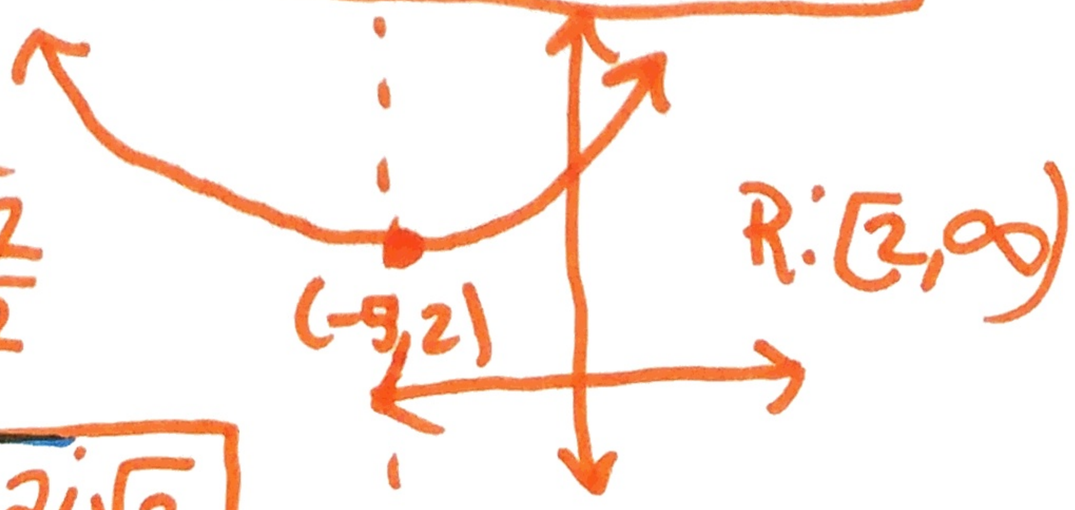
$x+5=\sqrt{4}\cdot\sqrt{-1}\cdot\sqrt{2}$

$x+5=\pm 2i\sqrt{2}$

$-5 \quad -5$

$x=-5\pm 2i\sqrt{2}$

2 complex sol'n



$f(x) = -\frac{1}{4}(x-1)^2 + 4$

$0 = -\frac{1}{4}(x-1)^2 + 4$

$-4 \quad -4$

$-4 = -\frac{1}{4}(x-1)^2 \cdot -4$

$\sqrt{16} = \sqrt{(x-1)^2}$

$\pm 4 = x - 1$

$x - 1 = 4$ or $x - 1 = -4$

$+1 \quad +1 \qquad +1 \quad +1$

$x = 5$ or $x = -3$

2 real soln's

R: $(-\infty, 4]$

$k(x) = -\frac{1}{3}(x+6)^2 + 5$

$0 = -\frac{1}{3}(x+6)^2 + 5$

$-5 \quad -5$

$-5 = -\frac{1}{3}(x+6)^2 \cdot -3$

$\sqrt{15} = \sqrt{(x+6)^2}$

$\pm\sqrt{15} = x + 6$

$-6 \quad -6$

$x = -6 \pm \sqrt{15}$

$\approx x = -6 + 3.9 \approx -2.1$

$x = -6 - 3.9 \approx -9.9$

2 real soln's (irrational)

$h(x) = 4(x-2)^2$

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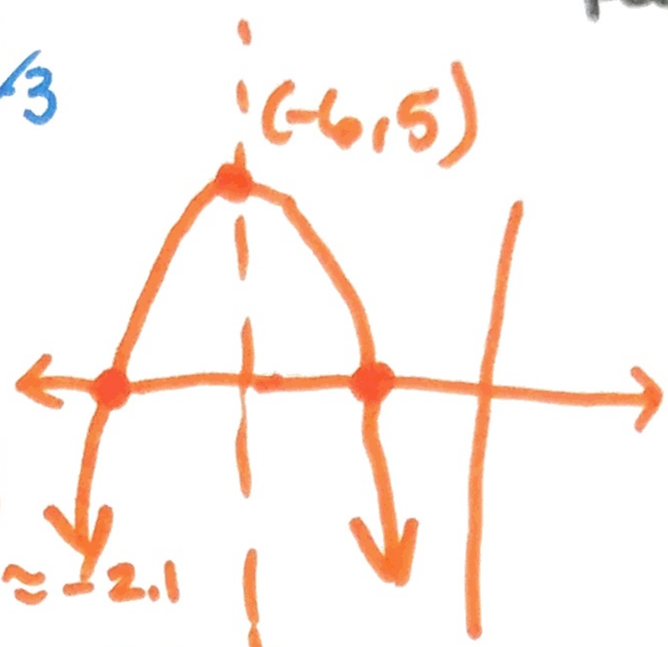


R $(-\infty, 5]$

$f(x) = \frac{2}{3}(x+4)^2 - 3$

See next page

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

$0 = (x-1)^2 + 2$

$-2 \quad -2$

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

$x - 1 = \sqrt{-2}$

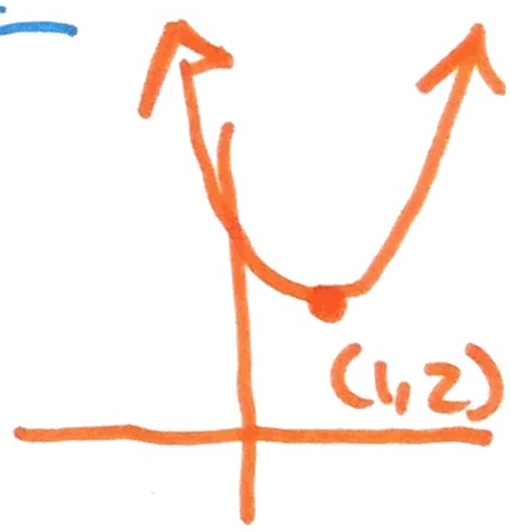
$x - 1 = \sqrt{-1 \cdot 2}$

$x - 1 = \pm i\sqrt{2}$

$+1 \quad +1$

$x = 1 \pm i\sqrt{2}$

2 complex (no real)



R: $[2, \infty)$

$f(x) = -2(x-6)^2 - 8$

$0 = -2(x-6)^2 - 8$

$+8 \quad +8$

$\frac{8}{-2} = \frac{-2(x-6)^2}{-2}$

$\sqrt{-4} = \sqrt{(x-6)^2}$

$x - 6 = \sqrt{4 \cdot -1}$

$x - 6 = \pm 2i$

$+6 \quad +6$

$x = 6 \pm 2i$

2 complex soln's

R: $(-\infty, -8]$

$g(x) = 5(x-3)^2 + 25$

$0 = 5(x-3)^2 + 25$

$-25 \quad -25$

$\frac{-25}{5} = \frac{5(x-3)^2}{5}$

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

$x - 3 = \sqrt{-5}$

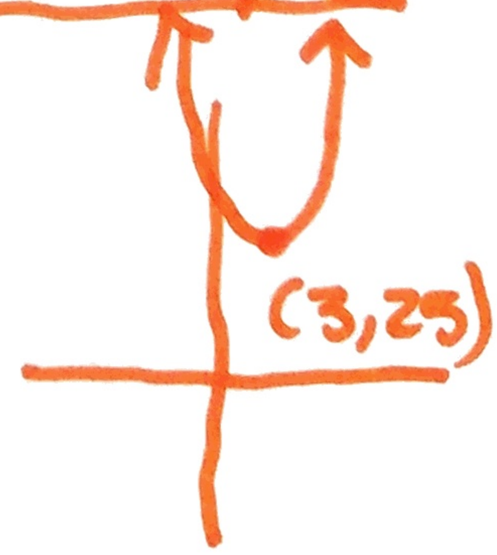
$x - 3 = \sqrt{-1 \cdot 5}$

$x - 3 = \pm i\sqrt{5}$

$+3 \quad +3$

$x = 3 \pm i\sqrt{5}$

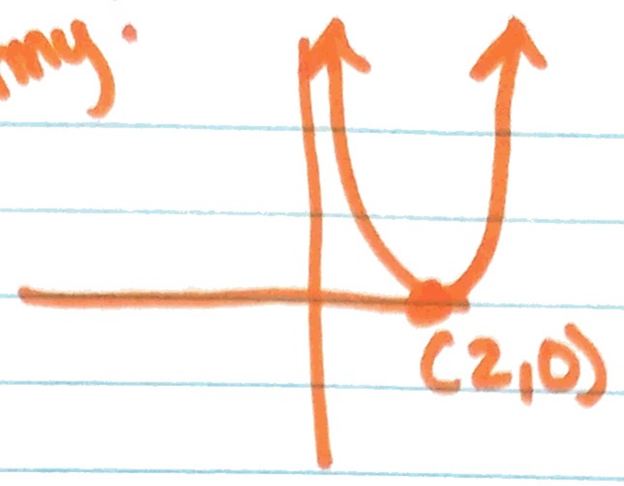
2 complex



R: $[25, \infty)$

$h(x) = 4(x-2)^2$ parent moved right 2 & got skinny!

$\frac{0}{4} = \frac{4(x-2)^2}{4}$



$R[0,\infty)$

$\sqrt{0} = \sqrt{(x-2)^2}$

$0 = x-2$ ← 1 real rpt sol'n b/c ±0 is just 0

$+2 \quad +2$

$2 = x$

$f(x) = \frac{2}{3}(x+4)^2 - 3$ parent moved left 4 down 3

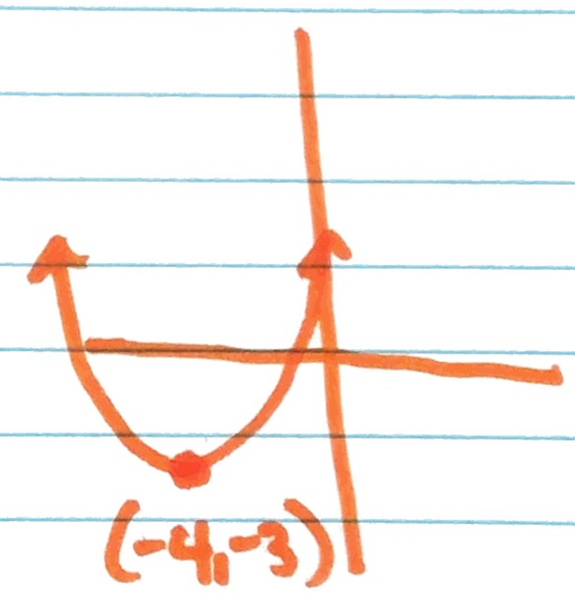
2 real sol'n irrational

$0 = \frac{2}{3}(x+4)^2 - 3$

$+3 \quad +3$

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

$\pm\sqrt{\frac{9}{2}} = \sqrt{(x+4)^2}$



R: $[-3,\infty)$

$x+4 = \sqrt{\frac{9}{2}}$ ← separate the √

$x+4 = \frac{\sqrt{9}}{\sqrt{2}}$

$x+4 = \pm\frac{3}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$ irrational denominators are not allowed (learned in unit 5)

$x+4 = \pm\frac{3\sqrt{2}}{2}$

$-4 \quad -4$

either way you write your answer is okay

$x = -4 \pm \frac{3\sqrt{2}}{2} \rightarrow -\frac{8}{2} \pm \frac{3\sqrt{2}}{2}$

$x = \frac{-8 \pm 3\sqrt{2}}{2}$