Algebra 2 Test Review

Unit 2B – Quadratic Functions and Relations

Name: Master Ego **Date:** _____ **Block:** _____

Target 1: I CAN simplify an expression containing complex numbers and or radicals.

What do you know about imaginary numbers?

- What is i? $\sqrt{-1}$
- What is i^2? -1
- What is the proper notation for a complex number? $a+bi$
- Do you know the Argand plane? -1, i, 1, $-i$

1-9: Simplify each expression. Circle your final answer.

1. $i + 3 + \sqrt{-4}$

$i+3+2i$

$3+3i$

2. $(-6-12i)-(-8+23i)$

$-6-12i$

$+8-23i$

$2-35i$

3. $(7-3i)(8+4i)$

$56-12i^2-24i+28i$

$56-12(-1)+4i$

$56+12+4i$

$68+4i$

4. $\sqrt{-180}$

$i\sqrt{180}$

$i\sqrt{9\cdot 20}$

$i\sqrt{9}\sqrt{4}\sqrt{5}$

$i\,3\cdot 2\sqrt{5} = 6i\sqrt{5}$

5. $\left(\sqrt{-32}\right)\left(3\sqrt{-48}\right)$

$i\sqrt{32}\cdot 3i\sqrt{48}$

$3i^2\sqrt{16\cdot 2\cdot 16\cdot 3}$

$3(-1)\cdot 4\cdot 4\sqrt{2\cdot 3}$

$-48\sqrt{6}$

6. $(3-i)^2$

$(3-i)(3-i)$

$9-i^2-3i-3i$

$9-(-1)-6i$

$10-6i$

7. i^{163}

i, -1, $-i$, 1, i^{160}

8. i^{236}

i, -1, $-i$, 1, $(i^4)^{59}$

9. i^{42}

i, -1, $-i$, 1, i^{40}

Target 2: I CAN solve a quadratic equation over the set of complex numbers using the most efficient method (factoring, square roots, or the quadratic formula).

How do you know when to use each method?

- **Factoring:** If it has a GCF and it factors
- **Square Roots:** If it is in vertex form $\Rightarrow 2(x-3)^2=8$
  If there is no b value $\Rightarrow x^2+10=0$
- **Quadratic Formula:** When it is in standard form and it doesn't factor. $\Rightarrow 3x^2-5x+2=0$

What does the discriminant ($b^2 - 4ac$) tell you about the nature of the roots?

- How many roots will it have? always 2!
- What if the discriminant is negative? the roots are complex (imaginary)
- What if the discriminant is zero? there is a repeated/double root
- What if the discriminant is a positive perfect square? there are 2 real rational roots
- What if the discriminant is not a positive perfect square? there are 2 real irrational roots

10-18: Solve each quadratic using the most efficient method: factoring, taking square roots, or the quadratic formula.
Circle the final answer. Irrational answers must be written in simplified radical form (no decimals).

10. $4x^2 + 20 = 0$

$-20 \quad -20$

$\frac{4x^2}{4} = \frac{-20}{4}$

$\sqrt{x^2} = \sqrt{-5}$

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

11. $6 = x^2 - x$

$x^2 - x - 6 = 0$

$(x-3)(x+2) = 0$

$x-3=0 \quad x+2=0$

$+3 \quad +3 \quad -2 \quad -2$

$x = 3 \quad x = -2$

12. $x^2 - 4 = 0$

$+4 \quad +4$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

or $(x+2)(x-2) =$ factors

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

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

$x = -2 \quad x = 2$

13. $x^2 - 9x = 0$

GCF! $x(x-9) = 0$

$x = 0 \quad x-9=0$

$+9 \quad +9$

$x = 9$

14. $4x^2 - 25 = 0$

$(2x+5)(2x-5) = 0$

$2x+5=0 \quad 2x-5=0$

$-5 \quad -5 \quad +5 \quad +5$

$\frac{2x}{2} = \frac{-5}{2} \quad \frac{2x}{2} = \frac{5}{2}$

$x = -\frac{5}{2} \quad x = \frac{5}{2}$

15. $7x^2 + 6x + 2 = 0$

$x = \frac{-6 \pm \sqrt{36 - 4(14)}}{14}$

$\frac{-6 \pm \sqrt{-20}}{14} = i\sqrt{4 \cdot 5}$

$\frac{-6 \pm 2i\sqrt{5}}{14} = \frac{-3 \pm i\sqrt{5}}{7}$

$x =$

↳ all ÷ by 2

16. $2x^2 - 5x = 12$

$2x^2 - 5x - 12 = 0$

$x = \frac{5 \pm \sqrt{25 - 4(-24)}}{4}$

$\frac{5 \pm \sqrt{121}}{4} = \frac{5 \pm 11}{4}$

$\frac{5+11}{4} \quad \frac{5-11}{4} = \frac{-6}{4} = -\frac{3}{2}$

$= \frac{16}{4} = 4$

17. $3(x+1)^2 + 4 = 22$

$-4 \quad -4$

$\frac{3(x+1)^2}{3} = \frac{18}{3}$

$\sqrt{(x+1)^2} = \sqrt{6}$

$x + 1 = \pm\sqrt{6}$

$-1 \quad -1$

$x = -1 \pm \sqrt{6}$

18. $x^2 - 4x - 32 = 0$

$(x-8)(x+4) = 0$

$x-8=0 \quad x+4=0$

$+8 \quad +8 \quad -4 \quad -4$

$x = 8 \quad x = -4$

Target 3: I CAN write a quadratic equation in any form given a combination of its parts.

Do you know all 3 forms of a quadratic function?

- **Standard:** $y=ax^2+bx+c$
- **Vertex:** $y=a(x-h)^2+k$
- **Intercept/Factored:** $y=a(x-p)(x-q)$

19-22: Write a quadratic function in standard form for the information given. Show all work used to find your equation!

19. roots: x = {–8, 7} and has a y-intercept of (0, –280)

$y=a(x+8)(x-7)$

$-280=a(8)(-7)$

$-280=-56a$

$\frac{-280}{-56}=\frac{-56a}{-56}$

$5=a$

$y=5(x+8)(x-7)$

$=5(x^2+x-56)$

$y=5x^2+5x-280$

20. vertex: (–4, 6) and contains the point: (–1, 9)

$y=a(x+4)^2+6$

$9=a(-1+4)^2+6$

$9=(3^2)a+6$

$9=9a+6$

$-6\quad -6$

$3=9a$

$\frac{3}{9}=\frac{9a}{9}$

$\frac{1}{3}=a$

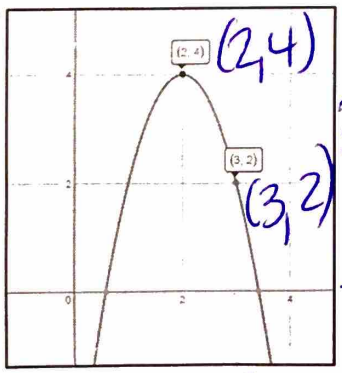
$y=\frac{1}{3}(x+4)^2+6$

$=\frac{1}{3}(x^2+8x+16)+6$

$y=\frac{1}{3}x^2+\frac{8}{3}x+\frac{16}{3}+6$

$y=\frac{1}{3}x^2+\frac{8}{3}x+\frac{34}{3}$

21.



(2, 4)

(3, 2)

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

$2=a(3-2)^2+4$

$2=a(1)^2+4$

$2=a+4$

$-4\quad -4$

$-2=a$

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

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

$=-2x^2+8x-8+4$

$y=-2x^2+8x-4$

22. Max at (–1, 4) and contains the point (2, –14)

$y=a(x+1)^2+4$

$-14=a(2+1)^2+4$

$-14=(3^2)a+4$

$-14=9a+4$

$-4\quad -4$

$-18=9a$

$\frac{-18}{+9}=\frac{9a}{9}$

$-2=a$

$y=-2(x+1)^2+4$

$=-2(x^2+2x+1)+4$

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

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

Target 4: I CAN solve non-linear systems of equations algebraically and graphically.

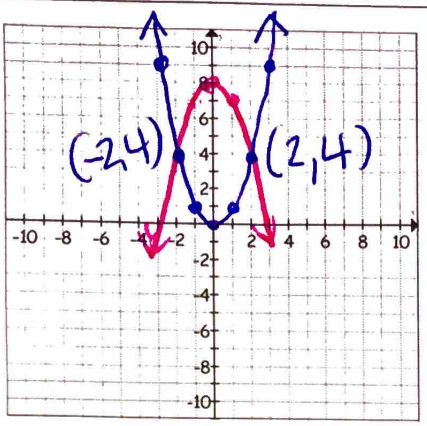
23-24: Graph each system below. Then solve it algebraically in the space on the right.

23.

$y = x^2$

$y = 8 - x^2$

$y = -x^2 + 8$



$+x^2 \quad +x^2$

$\frac{2x^2}{2} = \frac{8}{2}$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

$x = 2 \quad y = (2)^2 = 4$

$(2,4)$

$x = -2 \quad y = (-2)^2 = 4$

$(-2,4)$

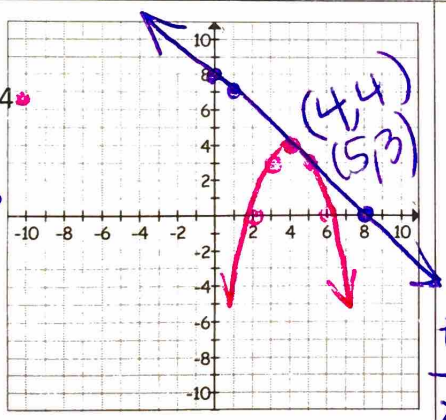
$(2,4)$ & $(-2,4)$

24.

$x + y = 8$

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

$y = -x + 8$



$-x + 8 = -(x-4)^2 + 4$

$-x + 8 = -(x^2 - 8x + 16) + 4$

$-x + 8 = -x^2 + 8x - 16 + 4$

$-x + 8 = -x^2 + 8x - 12$

$+x^2 - 8x + 12 \quad +x^2 - 8x + 12$

$x^2 - 9x + 20 = 0$

$(x-4)(x-5) = 0$

$x - 4 = 0 \quad x - 5 = 0$

$+4 \; +4 \quad +5 \; +5$

$x = 4 \quad x = 5$

$4 + y = 8 \quad 5 + y = 8$

$-4 \; -4 \quad -5 \; -5$

$y = 4 \quad y = 3$

$(4,4) \quad (5,3)$