Unit 4 Test Study Guide
(Solving Quadratic Equations)

Name: Key

Date: _____ Block: _____

Topic 1: Complex Numbers

Simplify each expresion below.

1. $\sqrt{-324}$ $= \sqrt{-1}\sqrt{324}$
$= \boxed{18i}$

2. $2\sqrt{-147}$
$= 2\sqrt{-1}\cdot\sqrt{3}\cdot\sqrt{49}$
$= 2(7)i\sqrt{3} = \boxed{14i\sqrt{3}}$

147
49 3

Add

3. $(-4+7i)+(-3-8i)$
$= -4-3+7i-8i$
$= \boxed{-7-i}$

Subtract

4. $(21+9i)-(13-2i)$
$= 21+9i-13+2i$
$= \boxed{8+11i}$

$\boxed{i^2=-1}$

Mult

5. $(1+5i)(4-2i)$
$= 4-2i+20i-10i^2$
$= 4+18i+10$
$= 14+18i$

6. $(7-i)^2$ $= (7-i)(7-i)$
$= 49-7i-7i+i^2$
$= 49-14i-1$
$= 48-14i$

7. $\frac{8}{-12i}\left(\frac{i}{i}\right) = \frac{8i}{-12i^2} = \frac{8i}{12}$
$= \boxed{\frac{2i}{3}}$

8. $\frac{(3-6i)}{(4-3i)}\cdot\frac{(4+3i)}{(4+3i)} = \frac{12+9i-24i-18i^2}{16+\cancel{12i}-\cancel{12i}-9i^2}$
$= \frac{12-15i+18}{16+9} = \frac{30-15i}{25}$
$= \boxed{\frac{6-3i}{5}}$

Simplify, ~~then name all sets to which the value belongs.~~

i i
$i^2=-1$
$i^3=-i$
i^4 1

9. i^{59}
$= (i^4)^{14}\cdot i^3$
$= 1(-i) = \boxed{-i}$

$\frac{59}{4} = 14$ R3

10. $(9+5i)(9-5i)$
$= 81-\cancel{45i}+\cancel{45i}-25i^2$
$= 81+25 = \boxed{106}$

Use the complex numbers to write an example of each property.

11. ~~Associative Property of Multiplication~~
$i^{10}\cdot i^{23} = i^{33} = (i^4)^8\cdot i$
$= \boxed{i}$

12. ~~Distributive Property~~
$(i^{12})^3\cdot i^3 = i^{36}\cdot i^3$
$= i^{39} = (i^4)^9\cdot i^3 = \boxed{-i}$

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13. ~~Name the additive identity of $(-10+4i)$~~

$(7-2i)-(2+6i)$

$7-2i-2-6i=5-8i$

14. ~~Name the multiplicative inverse of~~

$-i(-3+10i)=$

$3i-10i^2=3i+10=10+3i$

15. ~~Name all sets that are closed under subtraction.~~

$(5-2i)^2=(5-2i)(5-2i)$

$=25-10i-10i+4i^2=25-20i-4$

$=21-20i$

Topic 2: Solving Quadratics by Graphing

16. $x^2+10x+24=0$

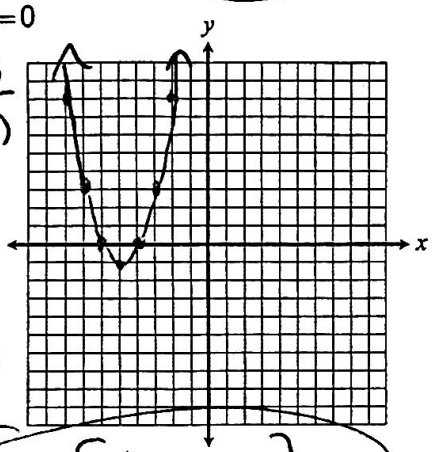
X-Vertex: $V=\frac{-b}{2a}=\frac{-10}{2(1)}$

$=-5$

y(vertex)

$=(-5)^2+10(-5)+24=-1$

$V(-5,-1)$



$X=\{-6;-4\}$

17. $-3x^2-6x=0$

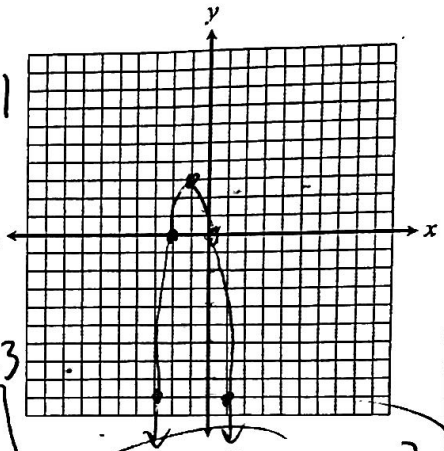
Vertex:

$X=\frac{6}{2(-3)}=-1$

$y=-3(-1)^2-6(-1)$

$=-3+6=3$

$V(-1,3)$



$X=\{0;-2\}$

Topic 3: Solving Quadratics by Factoring

18. $x^2-11x+18=0$

$=(X-9)(X-2)=0$

18; -9, -2; -11

$X=9$ $X=2$

$X=\{2;9\}$

19. $2x^2-32x+128=0$

$X^2-16X+64$

64; -8, -8; -16

$(X-8)(X-8)=0$

$(X-8)^2=0$

$X=8$

20. $8x^2+10x=0$

$2X(4X+5)=0$

$X=0$ $4X+5=0$

$4X=-5$

$X=-5/4$

$X=\{-\frac{5}{4};0\}$

21. $7x^2-19x-6=0$

$(7X+2)(X-3)=0$

$2x$

$-21x$

$-19x$

$X=-2/7$ $X=3$

$X=\{-\frac{2}{7};3\}$

Complete the table below.

Standard Form	Vertex Form (Identify Vertex & Axis of Symmetry)	Factored Form (Identify the Roots)
22. $f(x)=x^2+16x+63$	$f(x)=(x^2+16x+64)+63-64$ $f(x)=(x+8)^2-1$ $V(-8,-1)$ A.O.S: $x=-8$	$y=x^2+16x+63$ $=(x+9)(x+7)=0$ $x=-9 \mid x=-7$ $x=\{-9;-7\}$ 63: ?9, 7? ; 16
23. $f(x)=(x-\frac{1}{2})^2-\frac{25}{4}$ $=(x-\frac{1}{2})(x-\frac{1}{2})-\frac{25}{4}$ $=x^2-\frac{1}{2}x-\frac{1}{2}x+\frac{1}{4}-\frac{25}{4}$ $=x^2-x-\frac{24}{4}$ $=x^2-x-6$	$f(x)=\left(x-\frac{1}{2}\right)^2-\frac{25}{4}$ $V(\frac{1}{2},-\frac{25}{4})$ AOS: $x=\frac{1}{2}$	$f(x)=x^2-x-6$ $=(x+2)(x-3)=0$ $x=\{-2;3\}$

Topic 4: Solving Quadratics by Square Roots

24. $16x^2-1=0$

$16x^2=1$

$x^2=\frac{1}{16}$

$x=\pm\sqrt{\frac{1}{16}}=\frac{\pm\sqrt{1}}{\sqrt{16}}=\pm\frac{1}{4}$

25. $-3x^2+11=17$

$-3x^2=6$

$x^2=\frac{6}{-3}=-2$

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

26. $(x+5)^2=4$

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

$x+5=\pm 2$

$x=-5\pm 2$

$x=-5+2=-3$

$x=-5-2=-7$

$x=\{-7;-3\}$

27. $(x-8)^2-7=25$

$(x-8)^2=32$

$x-8=\pm\sqrt{32}$

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

16, 2

$x=8\pm 4\sqrt{2}$

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Topic 5: Solving Quadratics by Completing the Square

28. $x^2-8x-10=0$

$x^2-8x+_ = 10+_$

$x^2-8x+\underline{16} = 10+\underline{16}$

$(x-4)^2 = 26$

$x-4 = \pm\sqrt{26}$

$\boxed{x = 4\pm\sqrt{26}}$

29. $-4x^2-48x-20=0$

$\frac{-4x^2}{-4}-\frac{48x}{-4}-\frac{20}{-4}=\frac{0}{-4}$

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

$x^2+12x+_ = -5+_$

$x^2+12x+\underline{36} = -5+\underline{36}$

$(x+6)^2 = 31$

$x+6 = \pm\sqrt{31}$

$\boxed{x = -6\pm\sqrt{31}}$

Topic 6: Solving Quadratics by the Quadratic Formula

$x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$

30. $-x^2+3x-21=0$

$a=-1$
$b=3$
$c=-21$

$x = \frac{-3\pm\sqrt{3^2-4(-1)(-21)}}{2(-1)}$

$= \frac{-3\pm\sqrt{9-84}}{-2}$

$= \frac{-3\pm\sqrt{-75}}{-2} = \frac{-3\pm\sqrt{-3(25)}}{-2}$

$\boxed{x = \frac{-3\pm 5i\sqrt{3}}{-2}}$

31. $10x^2+8x-1=0$

$a=10,\ b=8,\ c=-1$

$x = \frac{-8\pm\sqrt{8^2-4(10)(-1)}}{2(10)}$

$= \frac{-8\pm\sqrt{64+40}}{20}$

$= \frac{-8\pm\sqrt{104}}{20} = \frac{-8\pm 2\sqrt{21}}{20}$

$\boxed{x = \frac{-4\pm\sqrt{26}}{10}}$

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