Algebra 2
Standards Review Worksheet – Q3

Name: Key
Period: _____

1. Functions:

Given: $f(x) = 3x + 5$ and $g(x) = x^2 + 3$ and $h(x) = x - 5$

EX: Find: $(f + g)(3)$

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

$= x^2 + 3x + 8$

$(f + g)(3) = 9 + 9 + 8 = \boxed{26}$

$f(3) + g(3) = 14 + 12 = \boxed{26}$

EX: Find: $(f \cdot g)(-2)$

$f(-2) \cdot g(-2) = [3(-2) + 5] \cdot [(-2)^2 + 3]$

$= -1 \cdot 7$

$= \boxed{-7}$

EX: Find: $f(1) - g(-2) + h(3)$

$= (3(1) + 5) - ((-2)^2 + 3) + (3 - 5)$

$= 8 - 7 + (-2)$

$= \boxed{-1}$

1. Given: $f(x) = 3x + 5$ and $g(x) = x^2 + 3$ and $h(x) = x - 5$

a) Find: $(g + h)(4)$

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

$= x^2 + x - 2$

$(g + h)(4) = 16 + 4 - 2 = \boxed{18}$

or

$g(4) + h(4) = 19 + -1 = \boxed{18}$

a) Find: $(g \cdot h)(2)$

$g(2) \cdot h(2) = (2^2 + 3) \cdot (2 - 5)$

$= 7 \cdot -3$

$= \boxed{-21}$

a) Find: $f(2) + g(-2) + h(4)$

$(3(2) + 5) + ((-2)^2 + 3) + (4 - 5)$

$= 11 + 7 - 1$

$= \boxed{17}$

2. Given: $f(x) = 3x + 5$ and $g(x) = x^2 + 3$ and $h(x) = x - 5$

b) Find: $(f - h)(-2)$

$f - h = (3x + 5) - (x - 5)$

$= 2x + 10$

$(f - h)(-2) = -4 + 10 = \boxed{6}$

or

$f(-2) - h(-2) = -1 - (-7) = \boxed{6}$

b) Find: $(f \cdot h)(-3)$

$f(-3) \cdot h(-3) = [3(-3) + 5] \cdot [-3 - 5]$

$= -4 \cdot -8$

$= \boxed{32}$

b) Find: $f(-1) - g(2) + h(-2)$

$(3(-1) + 5) - (2^2 + 3) + (-2 - 5)$

$= 2 - 7 + -7$

$= \boxed{-12}$

(1. Functions Continued)

EX: Find $f(g(2))$ = $f(g(2))$

work from inside out

$g(2) = 2^2 + 3 = 7$

$f(7) = 3(7) + 5 = \boxed{26}$

$(f \circ g)(2) = \boxed{26}$

a) Find $g(h(-3))$ = $g(h(-3))$

$h(-3) = -3 - 5 = -8$

$g(-8) = (-8)^2 + 3 = 67$

$(g \circ h)(-3) = \boxed{67}$

b) Find $g(f(2))$ = $g(f(2))$

$f(2) = 3(2) + 5 = 11$

$g(11) = 11^2 + 3 = 124$

$(g \circ f)(2) = \boxed{124}$

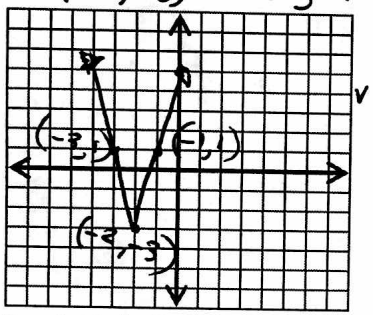
2. Graphing: Quadratics, Absolute Value, etc.

Graph. Label Vertex and 2 other points.

EX: $y = 4|x + 2| - 3$

V (-2, -3) 5 to by 4

X	Y
-3	1
-2 (V)	-3
-1	1

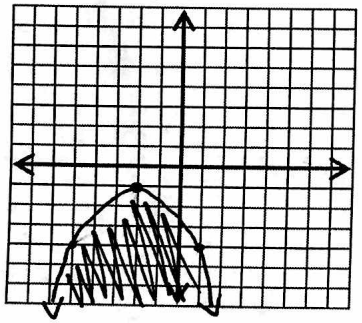


Graph. Label Vertex and 2 other points.

EX: $y \leq -\frac{1}{3}(x + 2)^2 - 1$

comp by 1/3, V (-2, -1) reflected

X	Y
-5	-4
-2	-1 (V)
1	-4

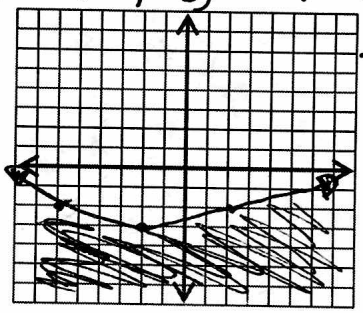


Graph. Label Vertex and 2 other points.

a) $y \leq \frac{1}{4}|x + 2| - 3$

V (-2, -3) comp by 1/4

X	Y
-6	-2
-2	-3 (V)
+2	-2

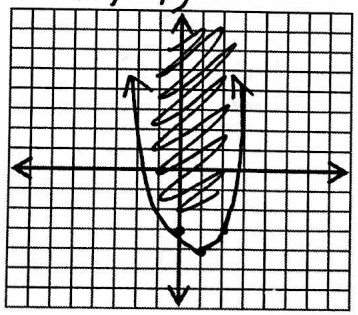


Graph. Label Vertex and 2 other points.

a) $y > (x - 1)^2 - 4$

V (1, -4)

X	Y
0	-3
1	-4
2	-3

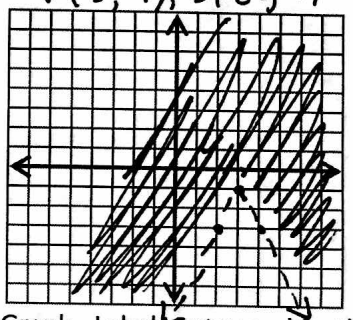


Graph. Label Vertex and 2 other points.

b) $y > -2|x - 3| - 1$

V (3, -1), 5 to by 2, reflected

X	Y
2	-3
3	-1 (V)
4	-3



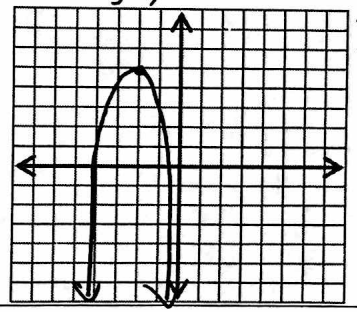
Graph. Label Vertex and 2 other points.

b) $y = -3(x + 2)^2 + 5$

V (-2, 5)

5 to by 3, reflected

X	Y
-2	5



3. Simplifying imaginary numbers.

Simplify:
EX: $(-2i^{12})(3i^{8})(4i^{9})(-2i^{33})$

$= 48i^{62}$
$= 48i^{2}$
$= 48(-1)$
$= \boxed{-48}$

Simplify:
a) $(3i^{16})(3i^{15})(-i^{7})(4i^{20})$

$= -36i^{58}$
$= -36i^{2}$
$= -36(-1)$
$= \boxed{36}$

Simplify:
b) $(-2i^{6})(-5i^{15})(-2i^{19})(4i^{23})$

$= -80i^{63}$
$= -80i^{3}$
$= -80(-i)$
$= \boxed{80i}$

4. Finding zeros/roots/solutions of a function.

EX: Find the zeros of the function.
$x^2 - 2x - 15 = y$

$x^2 - 2x - 15 = 0$
$(x-5)(x+3) = 0$
$\boxed{x = 5, -3}$

a) Find the zeros of the function.
$6x^2 + 14x + 8 = y$

$6x^2 + 14x + 8 = 0$
$2(3x^2 + 7x + 4) = 0$
$2(3x+4)(x+1) = 0$
$x = \boxed{-4/3, -1}$

b) Find the zeros of the function.
$x^3 + 4x^2 - 21x = y$

$x^3 + 4x^2 - 21x = 0$
$x(x^2 + 4x - 21) = 0$
$x(x+7)(x-3) = 0$
$x = \boxed{0, -7, 3}$

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

EX: Find the roots (real or complex).
$3x^2 - x + 5 = 0$

$= \frac{1 \pm \sqrt{1-4(3)(5)}}{2(3)}$
$= \frac{1 \pm \sqrt{-59}}{6}$
$= \boxed{\frac{1 \pm i\sqrt{59}}{6}}$

EX: Find the roots (real or complex).
$2x^2 + 4x + 1 = 0$

$= \frac{-4 \pm \sqrt{16-4(2)(1)}}{2(2)}$
$= \frac{-4 \pm \sqrt{8}}{4} = \frac{-4 \pm 2\sqrt{2}}{4}$
$= \boxed{\frac{-2 \pm \sqrt{2}}{2}}$

EX: Find the roots (real or complex).
$16x^2 - 36x + 1 = 0$

$= \frac{36 \pm \sqrt{1296-4(16)(1)}}{32}$
$= \frac{36 \pm \sqrt{1232}}{32}$
$= \frac{36 \pm 4\sqrt{77}}{32} = \boxed{\frac{9 \pm \sqrt{77}}{8}}$

5. **Factoring Polynomials**	**EX:** Factor: $48h^5 - 3h$ $= 3h(16h^4 - 1)$ $= 3h(4h^2 - 1)(4h^2 + 1)$ $= 3h(2h-1)(2h+1)(4h^2+1)$	**a)** Factor: $81x - 3x^4$ $= 3x(27 - x^3)$ $= 3x(3-x)(9+3x+x^2)$	**b)** Factor: $x^4 - 16x^2$ $= x^2(x^2 - 16)$ $= x^2(x-4)(x+4)$
	EX: Factor: $9m^4 - 4$ $= (3m^2 - 2)(3m^2 + 2)$	**a)** Factor: $81 - 4x^2$ $= (9 - 2x)(9 + 2x)$	**b)** $16x^4 - 9x^2$ $= x^2(16x^2 - 9)$ $= x^2(4x-3)(4x+3)$
	EX: Factor: $8 - 27x^3$ $(2-3x)(4+6x+9x^2)$	**a)** Factor: $64m^3 - 125$ $(4m-5)(16m^2+20m+25)$	**b)** Factor: $1 - 8y^3$ $(1-3y)(1+3y+9y^2)$
	EX: Factor: $1 + 64n^3$ $(1+4n)(1-4n+16n^2)$	**a)** Factor: $8x^3 + 125$ $(2x+5)(4x^2-10x+25)$	**b)** Factor: $64 + m^3$ $(4+m)(16-4m+m^2)$

6. Operations on Polynomials

Long Division:

EX: $6y+3\overline{)12y^2+36y+15}$

$2y+5$

$12y^2+6y$

$30y+15$

$30y+15$

0

$2y+5$

a) $4x+1\overline{)4x^3+5x^2-3x+1}$

x^2+x-1

$4x^3+x^2$

$4x^2-3x$

$4x^2+x$

$-4x+1$

$-4x-1$

2

$x^2+x-1+\frac{2}{4x+1}$

b) $2x+3\overline{)2x^4+3x^3-2x^2-3x-6}$

x^3-x

$2x^4+3x^3$

$-2x^2-3x$

$-2x^2-3x$

-6

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

Synthetic Division:

EX: $(x^4+x^2-3x+5)\div(x+2)$

-2 | $1\ 0\ 1\ -3\ 5$

$-2\ 4\ -10\ 26$

$1\ -2\ 5\ -13\ 31$

$x^3-2x^2+5x-13+\frac{31}{x+2}$

a) $(m^3+3m^2-7m-21)\div(m+3)$

-3 | $1\ 3\ -7\ -21$

$-3\ 0\ 21$

$1\ 0\ -7\ 0$

m^2-7

b) $(3a^4-6a^3-2a^2+a-6)\div(a+1)$

-1 | $3\ -6\ -2\ 1\ -6$

$-3\ 9\ -7\ 6$

$3\ -9\ 7\ -6\ 0$

$3a^3-9a^2+7a-6$

7. Simplifying Complex Numbers

EX: $(5-3i)(2+4i)$

$10+20i-6i+12$

$\boxed{22+14i}$

EX: $\frac{1+2i}{3-4i}$

$\frac{3+4i+6i-8}{9+16}$

$=\boxed{\frac{-5+10i}{25}} \rightarrow =\boxed{\frac{-1+2i}{5}}$

EX: i^{49}

$=\boxed{i}$

a) $(6+6i)(2-3i)$

$12-18i+12i+18$

$\boxed{30-6i}$

a) $\frac{2-5i}{4+i}\ \frac{(4-i)}{(4-i)} = \frac{8-22i-5}{17}$

$=\boxed{\frac{3-22i}{17}}$

a) $i^{23} = i^3 = \boxed{-i}$

b) $(4+2i)(3-3i)$

$12-12i+6i+6$

$\boxed{18-6i}$

b) $\frac{3+4i}{-6i}\frac{(6i)}{(6i)} = \frac{18i-24}{36}$

$=\boxed{\frac{3i-4}{6}}$

b) $i^{64} = \boxed{1}$

8. Simplifying Expressions with Integer Exponents

EX: $\left(\frac{4x^3y^{-4}z}{16x^5y^{-2}z^3}\right)^2$

$=\left(\frac{1}{4x^2y^2z^2}\right)^2$

$=\boxed{\frac{1}{16x^4y^4z^4}}$

a) $\left(\frac{25x^6y^2z^{-6}}{125x^2y^{-2}z^4}\right)^{-3}$

$=\left(\frac{1y^4y^4}{5z^{10}}\right)^{-3}$

$=\left(\frac{5z^{10}}{x^4y^4}\right)^3$

$=\boxed{\frac{125z^{30}}{x^{12}y^{12}}}$

b) $\left(\frac{3p^{-2}q^6r^5}{9q^{-3}r^3}\right)^4$

$=\left(\frac{1q^9r^2}{3p^2}\right)^4$

$=\boxed{\frac{q^{36}r^8}{81p^8}}$

9. Simplifying Radical Expressions	**EX:** $\sqrt[3]{64x^4y^{12}z^0}$ $4xy^4\sqrt[3]{x}$	a) $\sqrt{8x^5y^{10}z^2}$ $2x^2\lvert y^5\rvert\sqrt{2x}$	**b)** b) $\sqrt[4]{16a^6b^9c^8}$ $2\lvert a\rvert b^2c^2\sqrt[4]{a^2b}$
10. Pascal's Triangle/Binomial Theorem	**EX:** Find the 3rd term of $(2x+3)^4$ $6(2x)^2(3)^2$ $=6(4x^2)(9)$ $=216x^2$	**a)** Find the 3rd term of $(4-2x)^5$ $=10(4)^2(-2x)^3$ $=10(16)(-8x^3)$ $=-1280x^3$	**b)** Find the 4th term of $(3x-4)^6$ $=20(3x)^3(-4)^3$ $=20(27x^3)(-64)$ $=-34,560x^3$