26.) $\sqrt{\frac{17}{12}}$ $\frac{\sqrt{17}}{\sqrt{12}} \cdot \frac{\sqrt{12}}{\sqrt{12}}$

$\frac{\sqrt{204}}{12}$

$\frac{\sqrt{4} \cdot \sqrt{51}}{12} = \frac{2\sqrt{51}}{12} = \boxed{\frac{\sqrt{51}}{6}}$

27.) $\sqrt{\frac{6}{5}}$ $\frac{\sqrt{6}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

$\boxed{\frac{\sqrt{30}}{5}}$

28.) $\frac{2}{4+\sqrt{11}} \cdot \frac{4-\sqrt{11}}{4-\sqrt{11}}$

$\frac{8-2\sqrt{11}}{16-11}$

$\boxed{\frac{8-2\sqrt{11}}{5}}$

29.) $\frac{4}{8-\sqrt{3}} \cdot \frac{8+\sqrt{3}}{8+\sqrt{3}}$

$\frac{32+4\sqrt{3}}{64-3}$

$\boxed{\frac{32+4\sqrt{3}}{61}}$

Solve the equation for x. Write your answer in simplest radical form.

30.) $5x^2 = 80$

$\frac{5x^2}{5} = \frac{80}{5}$

$x^2 = 16$

$\sqrt{x^2} = \pm\sqrt{16}$

$\boxed{x = \pm 4}$

31.) $x^2 = 84$

$\sqrt{x^2} = \pm\sqrt{84} < \begin{matrix}\sqrt{4} \\ \sqrt{21}\end{matrix}$

$\boxed{x = \pm 2\sqrt{21}}$

32.) $7x^2 - 10 = 25$

$+10 \quad +10$

$\frac{7x^2}{7} = \frac{35}{7}$

$x^2 = 5$

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

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

33.) $3\left(\frac{1}{3}(x-4)^2\right) = (11)3$

$(x-4)^2 = 33$

$\sqrt{(x-4)^2} = \pm\sqrt{33}$

$x - 4 = \pm\sqrt{33}$

$\boxed{x = 4 \pm \sqrt{33}}$

34.) $2(x+2)^2 - 5 = 8$

$2(x+2)^2 = 13$

$(x+2)^2 = \frac{13}{2}$

$\sqrt{(x+2)^2} = \pm\sqrt{\frac{13}{2}}$

$x + 2 = \pm\sqrt{\frac{13}{2}} \rightarrow \frac{\sqrt{13}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{26}}{2}$

$\boxed{x = -2 \pm \frac{\sqrt{26}}{2}}$

35.) The path of a basketball thrown at an angle of 45° can be modeled by $y = -.02x^2 + x + 6$.

a.) What is the maximum height of the basketball?

vertex: $(25, 18.5)$ $\boxed{18.5 \text{ ft}}$

$x = \frac{-b}{2a} = \frac{-(1)}{2(-0.02)} = 25$

$y = -0.02(25)^2 + 25 + 6$

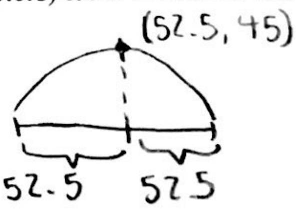
$y = 18.5$

b.) What height is the basketball thrown from?

y-int: $(0, 6)$ $\boxed{6 \text{ ft}}$

36.) The arch of the Gateshead Millennium Bridge forms a parabola with equation $y = -0.016(x - 52.5)^2 + 45$ where x is the horizontal distance (in meters) from the arch's left end and y is the distance (in meters) from the base of the arch.

What is the width of the arch? vertex: $(52.5, 45)$



$52.5 + 52.5$

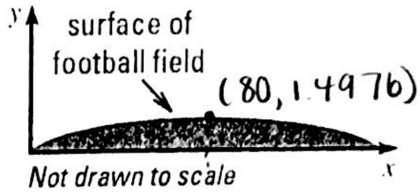
$\boxed{105 \text{ m}}$

37.) Although a football field appears to be flat, its surface is actually shaped like a parabola so that rain runs off to both sides. The cross section of a field with synthetic turf can be modeld by

$y = -0.000234x(x - 160)$ vertex: $\frac{p+q}{2}$

$\frac{0+160}{2} = 80$

where x and y are measured in feet.



a.) What is the field's width?

$80 + 80$ $\boxed{160 \text{ ft}}$

b.) What is the maximum height of the field's surface?

$y = -0.000234(80)(80-160)$

$y = 1.4976 \approx \boxed{1.5 \text{ ft}}$

38.) An arch to the entrance of the library can be modeled by $y = -0.13x^2 + 2.5x$ where x and y are measured in feet. To the nearest foot, what is the height of the highest point of the arch?

$x = \frac{-b}{2a} = \frac{-2.5}{2(-0.13)} \approx 9.615$ vertex: $(9.615, 12.019)$

$y = -0.13(9.615)^2 + 2.5(9.615)$

$y \approx 12.019 \approx \boxed{12 \text{ ft}}$

39.) **When an object is dropped, its height h (in feet) above the ground after t seconds can be modeled by the function.**

$$h = -16t^2 + h_0$$

where h_0 is the objects initial height (in feet).

A cliff diver dives off a cliff 40 feet above water.

a.) Write and equation giving the diver's height h (in feet) above the water after t seconds.

$\boxed{h = -16t^2 + 40}$

b.) How long is the diver in the air? (Round answers to the nearest tenth of a second)

$0 = -16t^2 + 40$

$-40 = -16t^2$ $\rightarrow$ $2.5 = t^2$

$t = \pm 1.58 \approx \boxed{1.6 \text{ seconds}}$

40.) The air resistance R (in pounds) on a racing cyclist is given by the equation $R = 0.00829s^2$ where s is the bicycle's speed (in miles per hour).

What is the speed of a racing cyclist who experiences 5 pounds of air resistance?

$5 = 0.00829s^2$

$s^2 \approx 603.136$

$\sqrt{s^2} \approx \pm\sqrt{603.136}$

$s \approx \pm 24.5588 \approx \boxed{24.6 \text{ mph}}$

Chapter 4 (Part 2) Review Worksheet *Name:* KEY

Solve the equation.

1.) $x^2 + 9 = 4$

$x^2 = -5$

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

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

2.) $x^2 = 2x^2 + 4$

$-x^2 = 4$

$x^2 = -4$

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

$\boxed{x = \pm 2i}$

3.) $\frac{1}{3}x^2 + 10 = -23$

$\frac{1}{3}x^2 = -33$

$x^2 = -99$

$\sqrt{x^2} = \pm\sqrt{-99}$ i, $\sqrt{9}$, $\sqrt{11}$

$\boxed{x = \pm 3i\sqrt{11}}$

4.) $-5x^2 - 3 = 97$

$-5x^2 = 100$

$x^2 = -20$

$\sqrt{x^2} = \pm\sqrt{-20}$ i, $\sqrt{4}$, $\sqrt{5}$

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

5.) $(x - 10)^2 = -54$

$\sqrt{(x-10)^2} = \pm\sqrt{-54}$ i, $\sqrt{9}$, $\sqrt{6}$

$x - 10 = \pm 3i\sqrt{6}$

$\boxed{x = 10 \pm 3i\sqrt{6}}$

6.) $-(x + 7)^2 + 8 = 44$

$-(x+7)^2 = 36$

$(x+7)^2 = -36$

$\sqrt{(x+7)^2} = \pm\sqrt{-36}$

$x + 7 = \pm 6i$

$\boxed{x = -7 \pm 6i}$

Write the expression as a complex number in standard form.

7.) $(8 - 6i) + (7 + 4i)$

$8 + 7 - 6i + 4i$

$\boxed{15 - 2i}$

8.) $(2 - 3i) - (6 - 5i)$

$2 - 6 - 3i + 5i$

$\boxed{-4 + 2i}$

9.) $(3 + 4i) - (2 - 5i)$

$3 - 2 + 4i + 5i$

$\boxed{1 + 9i}$

10.) $-9i(2 - i)$ $* i^2 = -1$

$-18i + 9i^2$

$-18i - 9$

$\boxed{-9 - 18i}$

11.) $(5 + i)(4 - 2i)$

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

$20 - 6i + 2$

$\boxed{22 - 6i}$

12.) $(2 - 7i)(-8 - 3i)$

$-16 - 6i + 56i + 21i^2$

$-16 + 50i - 21$

$\boxed{-37 + 50i}$

13.) $\frac{4i}{-3+6i} \cdot \frac{-3-6i}{-3-6i}$

$\frac{-12i-24i^2}{9-36i^2}$

$\frac{-12i+24}{9+36}$

$\frac{24-12i}{45}$

$\frac{24}{45}-\frac{12}{45}i = \boxed{\frac{8}{15}-\frac{4}{15}i}$

14.) $\frac{3+i}{2-3i} \cdot \frac{2+3i}{2+3i}$

$\frac{6+9i+2i+3i^2}{4-9i^2}$

$\frac{6+11i-3}{4+9}$

$\frac{3+11i}{13}$

$\boxed{\frac{3}{13}+\frac{11}{13}i}$

15.) $\frac{5+i}{7+4i} \cdot \frac{7-4i}{7-4i}$

$\frac{35-20i+7i-4i^2}{49-16i^2}$

$\frac{35-13i+4}{49+16}$

$\frac{39-13i}{65}$

$\frac{39}{65}-\frac{13}{65}i = \boxed{\frac{3}{5}-\frac{1}{5}i}$

Use the properties of exponents to write the complex number in standard form.

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

16.) $-5 + i^7$ $\quad 7 \div 4 = 1 \text{ R}3$ $\quad i^3$

$\boxed{-5-i}$

17.) $4 + i^{29}$ $\quad 29 \div 4 = 7 \text{ R}1$ $\quad i^1$

$\boxed{4+i}$

18.) $-11 - 2i^{66}$ $\quad 66 \div 4 = 16 \text{ R}2$ $\quad i^2$

$-11-2(-1)$

$-11+2$

$\boxed{-9}$

19.) $15 + 7i^{76}$ $\quad 76 \div 4 = 19 \text{ R}0$ $\quad i^4$

$15+7(1)$

$15+7$

$\boxed{22}$

Solve the equation by completing the square. $\left(\frac{b}{2}\right)^2$

20.) $x^2 + 16x - 17 = 0$ $\quad \left(\frac{16}{2}\right)^2 \to (8)^2 \to 64$

$x^2+16x+\boxed{64} = 17+\boxed{64}$

$(x+8)^2 = 81$

$x+8 = \pm 9$

$x = -8 \pm 9$

$\boxed{x=1}$ $\boxed{x=-17}$

21.) $x^2 - 6x - 15 = 0$ $\quad \left(\frac{6}{2}\right)^2 \to (3)^2 \to 9$

$x^2-6x+\boxed{9} = 15+\boxed{9}$

$(x-3)^2 = 24$

$x-3 = \pm\sqrt{24}$ $\quad \sqrt{4}\ \sqrt{6}$

$\boxed{x = 3 \pm 2\sqrt{6}}$

22.) $\frac{2x^2 + 8x - 28}{2} = \frac{0}{2}$ $\quad \left(\frac{4}{2}\right)^2 \to (2)^2 \to 4$

$x^2+4x-14=0$

$x^2+4x+\boxed{4} = 14+\boxed{4}$

$(x+2)^2 = 18$

$x+2 = \pm\sqrt{18}$ $\quad \sqrt{9}\ \sqrt{2}$

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

23.) $x^2 + 24x + 244 = 0$ $\quad \left(\frac{24}{2}\right)^2 \to (12)^2 \to 144$

$x^2+24x+\boxed{144} = -244+\boxed{144}$

$(x+12)^2 = -100$

$x+12 = \pm\sqrt{-100}$

$x+12 = \pm 10i$

$\boxed{x = -12 \pm 10i}$

Write the quadratic function in vertex form. Then identify the vertex.

24.) $y = x^2 + 14x + 39$

$\left(\frac{14}{2}\right)^2 \to (7)^2 \to 49$

$\boxed{49} + y = x^2 + 14x + \boxed{49} + 39$

$49 + y = (x+7)^2 + 39$

$\boxed{y = (x+7)^2 - 10}$

$\boxed{\text{vertex}: (-7, -10)}$

25.) $y = x^2 - 20x + 125$

$\left(\frac{20}{2}\right)^2 \to (10)^2 \to 100$

$\boxed{100} + y = x^2 - 20x + \boxed{100} + 125$

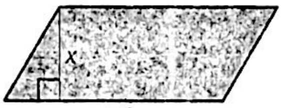
$100 + y = (x-10)^2 + 125$

$\boxed{y = (x-10)^2 + 25}$

$\boxed{\text{vertex}: (10, 25)}$

Find the value of *x*.

26.) Area of parallelogram = 48 units^2
($A = b \bullet h$)



$x + 6$

$48 = x(x+6)$

$\left(\frac{6}{2}\right)^2 \to (3)^2 \to 9$

$48 = x^2 + 6x$

$x^2 + 6x + \boxed{9} = 48 + \boxed{9}$

$(x+3)^2 = 57$

$x + 3 = \pm\sqrt{57}$

$\boxed{x = -3 \pm \sqrt{57}}$

27.) Area of rectangle = 78 units^2

x

$x + 7$

$78 = x(x+7)$

$\left(\frac{7}{2}\right)^2 \to (3.5)^2 \to 12.25$

$78 = x^2 + 7x$

$x^2 + 7x + \boxed{12.25} = 78 + \boxed{12.25}$

$\left(x + \frac{7}{2}\right)^2 = 90.25$

$x + 3.5 = \pm 9.5$

$x = -3.5 \pm 9.5$

$\boxed{x = 6}$ $\cancel{x = -13}$

Use the quadratic equation to solve the equation.

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

28.) $x^2 + 4x - 3 = 0$

a b c

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

$x = \dfrac{-4 \pm \sqrt{28}}{2}$ $< \begin{matrix}\sqrt{4} \\ \sqrt{7}\end{matrix}$

$x = \dfrac{-4 \pm 2\sqrt{7}}{2}$

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

29.) $9x^2 = -6x - 1$

$9x^2 + 6x + 1 = 0$

a b c

$x = \dfrac{-6 \pm \sqrt{(6)^2 - 4(9)(1)}}{2(9)}$

$x = \dfrac{-6 \pm \sqrt{0}}{18}$

$x = \dfrac{-6}{18}$

$\boxed{x = -\frac{1}{3}}$

30.) $6x^2 - 8x = -3$

$6x^2 - 8x + 3 = 0$

a b c

$x = \dfrac{-(-8) \pm \sqrt{(-8)^2 - 4(6)(3)}}{2(6)}$

$x = \dfrac{8 \pm \sqrt{-8}}{12}$ $< \begin{matrix} i \\ \sqrt{4} \\ \sqrt{2}\end{matrix}$

$x = \dfrac{8 \pm 2i\sqrt{2}}{12}$

$\boxed{x = \dfrac{4 \pm i\sqrt{2}}{6}}$

31.) $3x^2 + 10x - 5 = 0$

a b c

$x = \dfrac{-10 \pm \sqrt{(10)^2 - 4(3)(-5)}}{2(3)}$

$x = \dfrac{-10 \pm \sqrt{160}}{6}$ $< \begin{matrix}\sqrt{16} \\ \sqrt{10}\end{matrix}$

$x = \dfrac{-10 \pm 4\sqrt{10}}{6}$

$\boxed{x = \dfrac{-5 \pm 2\sqrt{10}}{3}}$

32.) A person spikes a volleyball over a net when the ball is 9 feet above the ground. The volleyball has an initial vertical velocity of -40 feet per second. The volleyball is allowed to fall to the ground. How long is the ball in the air after it is spiked?

$h = -16t^2 + V_0 t + h_0$

$0 = -16t^2 - 40t + 9$

$t = \frac{-(-40) \pm \sqrt{(-40)^2 - 4(-16)(9)}}{2(-16)}$

$t = \frac{40 \pm \sqrt{2176}}{-32}$

$t \approx \cancel{-2.71},\ 0.21 \approx \boxed{0.21 \text{ seconds}}$

33.) A juggler tosses a ball into the air. The ball leaves the juggler's hand 4 feet above the ground and has an initial vertical velocity of 40 feet per second. The juggler catches the ball when it falls back to a height of 3 feet. How long is the ball in the air?

$h = -16t^2 + V_0 t + h_0$

$3 = -16t^2 + 40t + 4$

$0 = -16t^2 + 40t + 1$

$t = \frac{-40 \pm \sqrt{(40)^2 - 4(-16)(1)}}{2(-16)}$

$t = \frac{-40 \pm \sqrt{1664}}{-32}$

$t \approx \cancel{-0.025},\ 2.525 \approx \boxed{2.5 \text{ seconds}}$

34.) $y \leq -2x^2 + 8x - 5$ dashed

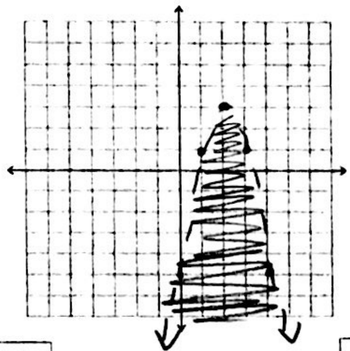
AOS: $x = 2$

vertex: $(2, 3)$

$x = \frac{-8}{2(-2)} = \frac{-8}{-4} = 2$

Test: x|y 0|0 ✗ $0 \not\leq -5$

x	0	1	2	3	4
y	-5	1	3	1	-5



35.) $y \geq -(x + 5)(x + 1)$ solid

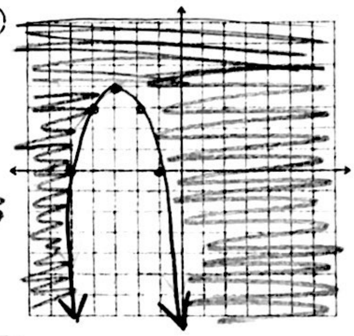
AOS: $x = -3$

vertex: $(-3, 4)$

$x = \frac{-5 + -1}{2} = \frac{-6}{2} = -3$

Test: x|y 0|0 ✓ $0 \geq -5$

x	-5	-4	-3	-2	-1
y	0	3	4	3	0



36.) $y > 2(x - 4)^2 - 5$ dashed

$y \leq -x^2 + 4x + 2$ solid

vertex: $(4, -5)$

x	2	3	4	5	6
y	3	-3	-5	-3	3

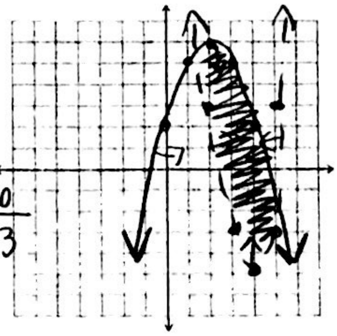
Test: x|y 0|0 ✗ $0 \not> 27$

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

vertex: $(2, 6)$

x	0	1	2	3	4
y	2	5	6	5	2

Test: x|y 0|0 ✓ $0 \leq 2$



37.) $y < 2x^2 + 2$ dashed

$y \geq -x^2 - 3$ solid

vertex: $(0, 2)$

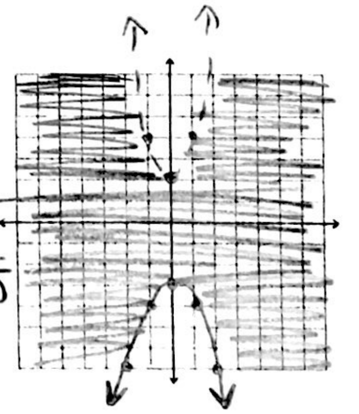
x	-2	-1	0	1	2
y	10	4	2	4	10

Test: x|y 0|0 ✓ $0 < 2$

vertex: $(0, -3)$

x	-2	-1	0	1	2
y	-7	-4	-3	-4	-7

Test: x|y 0|0 ✓ $0 \geq -3$



Chapter 5 Review Worksheet *Name:* KEY

Simplify the expression. Evaluate all powers with numerical bases. NO DECIMALS.

1.) $(x^{-2}y^5)^2$

$x^{-4}y^{10}$

$\boxed{\dfrac{y^{10}}{x^4}}$

2.) $(3x^4y^{-2})^{-3}$

$3^{-3}x^{-12}y^6$

$\dfrac{y^6}{3^3x^{12}}$

$\boxed{\dfrac{y^6}{27x^{12}}}$

3.) $\dfrac{2x^{-6}y^5}{16x^3y^{-2}}$

$\dfrac{2x^{-9}y^7}{16}$

$\boxed{\dfrac{y^7}{8x^9}}$

4.) $\dfrac{(3m^{-2}n^4)^{-3}}{9m^3n^{-3}} \cdot \dfrac{m^{-6}}{n^8}$

$\dfrac{3^{-3}m^6n^{-12}}{9m^3n^{-3}} \cdot \dfrac{m^{-6}}{n^8}$

$\dfrac{3^{-3}n^{-12}}{9m^3n^5}$

$\dfrac{n^{-17}}{9 \cdot 3^3m^3}$

$\boxed{\dfrac{1}{243m^3n^{17}}}$

5.) $\dfrac{5a^3}{(10b)^2} \cdot \dfrac{b^{-5}a^2}{a^7b^0}$

$\dfrac{5a^3}{100b^2} \cdot \dfrac{b^{-5}a^2}{a^7}$

$\dfrac{5a^5b^{-5}}{100a^7b^2}$

$\dfrac{a^{-2}b^{-7}}{20}$

$\boxed{\dfrac{1}{20a^2b^7}}$

6.) $(2x^{-2}y^7)(12x^{-6}y^{-3})$

$24x^{-8}y^4$

$\boxed{\dfrac{24y^4}{x^8}}$

Decide whether the function is a polynomial function. If so, write it in standard form and state its degree, type, and leading coefficient. If it is not a polynomial, explain why.

7.) $f(x) = x^4 - \frac{1}{4}x^2 + 3$ Yes

SF: $f(x) = x^4 - \frac{1}{4}x^2 + 3$

D: 4

Type: Quartic

LC: 1

8.) $h(x) = 5x^2 + 3x^{-1} - x$ No

can't have negative exponents

9.) $g(x) = x + 2^x - 0.6x^5$ No

can't have variable exponents

10.) $j(x) = 7x - \sqrt{3} + \pi x^2$ Yes

SF: $j(x) = \pi x^2 + 7x - \sqrt{3}$

D: 2

Type: Quadratic

LC: π

Evaluate the function for the given value of *x* using both direct and synthetic substitution.

11.) $g(x) = 2x^4 - 5x^3 - 4x + 8$ when $x = 3$

$g(3) = 2(3)^4 - 5(3)^3 - 4(3) + 8$

$= 162 - 135 - 12 + 8$

$\boxed{g(3) = 23}$

3	2	-5	0	-4	8
	↓	6	3	9	15
	2	1	3	5	23

$\boxed{g(3) = 23}$

12.) $f(x) = x^5 - 2x^3 + 15$ when $x = 4$

$f(4) = (4)^5 - 2(4)^3 + 15$

$= 1024 - 128 + 15$

$\boxed{f(4) = 911}$

4	1	0	-2	0	0	15
	↓	4	16	56	224	896
	1	4	14	56	224	911

$\boxed{f(4) = 911}$

Describe the end behavior of the graph of the polynomial function by completing the statements. (Hint: Sketch a general picture of the graph to help).

13.) $f(x) = -8x^{10} + 21x^3$

D: even

LC: −

$f(x) \to$ $-\infty$ as $x \to -\infty$

$f(x) \to$ $-\infty$ as $x \to +\infty$

↙ ↘

14.) $f(x) = 12x^{15} - 2x^{14} + 8x^7 + 99$

D: odd

LC: +

$f(x) \to$ $-\infty$ as $x \to -\infty$

$f(x) \to$ $+\infty$ as $x \to +\infty$

↗ ↙

15.) $f(x) = -x^5 + 1$

D: odd

LC: −

$f(x) \to$ $+\infty$ as $x \to -\infty$

$f(x) \to$ $-\infty$ as $x \to +\infty$

↖ ↘

16.) $f(x) = \frac{1}{2}x^6 + 8x^3 - 11x^2 + 19$

D: even

LC: +

$f(x) \to$ $+\infty$ as $x \to -\infty$

$f(x) \to$ $+\infty$ as $x \to +\infty$

↖ ↗

Perform the indicated operation.

17.) $(5x^3 - x + 3) + (x^3 - 9x^2 + 4x)$

$\boxed{6x^3 - 9x^2 + 3x + 3}$

18.) $(x^3 + 4x^2 - 5x) - (4x^3 + x^2 - 7)$

$\boxed{-3x^3 + 3x^2 - 5x + 7}$

19.) $(x-6)(5x^2+x-8)$

$x(5x^2+x-8)-6(5x^2+x-8)$

$5x^3+x^2-8x-30x^2-6x+48$

$\boxed{5x^3-29x^2-14x+48}$

20.) $[(x-4)(x+7)](5x-1)$

$(x^2+7x-4x-28)(5x-1)$

$(5x-1)(x^2+3x-28)$

$5x(x^2+3x-28)-1(x^2+3x-28)$

$5x^3+15x^2-140x-x^2-3x+28$

$\boxed{5x^3+14x^2-143x+28}$

Factor the polynomial completely.

21.) $64x^3-8$

*difference of cubes

$8(8x^3-1)$

$(2x)^3 \quad (1)^3$

$\boxed{8(2x-1)(4x^2+2x+1)}$

22.) $2x^5-12x^3+10x$

$2x(x^4-6x^2+5)$

$2x(x^2-5)(x^2-1)$

$\boxed{2x(x^2-5)(x+1)(x-1)}$

23.) $2x^3-7x^2-8x+28$

$x^2(2x-7)-4(2x-7)$

$(2x-7)(x^2-4)$

$\boxed{(2x-7)(x+2)(x-2)}$

24.) $27g^3+343$

*sum of cubes

$(3g)^3 \quad (7)^3$

$\boxed{(3g+7)(9g^2-21g+49)}$

Find the real-number solutions of the equation (Start by factoring).

25.) $16g^4-625=0$

$(4g^2)^2 \quad (25)^2$

$(4g^2+25)(4g^2-25)=0$

$(4g^2+25)(2g+5)(2g-5)=0$

$4g^2+25$

$g^2=-25/4$

no real solution

$2g+5=0$

$\boxed{g=-5/2}$

$2g-5=0$

$\boxed{g=5/2}$

26.) $16x^3-44x^2-42x=0$

$8\cdot-21=-168$

$-28+6=-22$

$2x(8x^2-22x-21)=0$

$2x(8x^2-28x+6x-21)=0$

$2x(4x(2x-7)+3(2x-7))=0$

$2x(2x-7)(4x+3)=0$

$2x=0$

$\boxed{x=0}$

$2x-7=0$

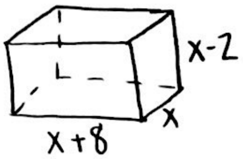
$\boxed{x=7/2}$

$4x+3=0$

$\boxed{x=-3/4}$

27.) A shipping box is shaped like a rectangular prism. It has a total volume of 96 cubic inches. The height is two inches less than the width and the length is eight inches longer than the width.

a.) Write a polynomial equation in standard form that represents the volume of the box.



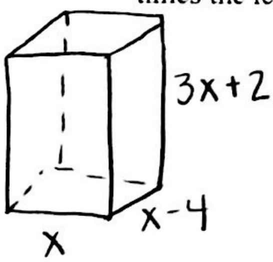
$$V = x(x+8)(x-2)$$
$$= x(x^2 - 2x + 8x - 16)$$
$$= x(x^2 + 6x - 16)$$
$$\boxed{V = x^3 + 6x^2 - 16x}$$

b.) Solve the polynomial equation from part a. What are the dimensions of the box?

$$96 = x^3 + 6x^2 - 16x$$
$$0 = x^3 + 6x^2 - 16x - 96$$
$$0 = x^2(x+6) - 16(x+6)$$
$$0 = (x+6)(x^2 - 16)$$
$$0 = (x+6)(x+4)(x-4)$$
$$\cancel{x=-6} \quad \cancel{x=-4} \quad x = 4$$

h: 2 in
w: 4 in
l: 12 in

28.) You have 240 cubic inches of clay with which to make a sculpture shaped like a rectangular prism. You want the width to be 4 inches less than the length and the height to be 2 inches more than 3 times the length. What should the dimensions of the box be?



$$x(x-4)(3x+2) = 240$$
$$x(3x^2 + 2x - 12x - 8) = 240$$
$$x(3x^2 - 10x - 8) = 240$$
$$3x^3 - 10x^2 - 8x = 240$$
$$3x^3 - 10x^2 - 8x - 240 = 0$$
$$x^2(3x - 10) + 8(x - 30) = 0$$

??

We need an additional method to factor this!

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Chapter 5 (Part 2) Review Worksheet Name: KEY

Divide using polynomial long division.

1.) $(x^2 + 5x - 14) \div (x - 2)$

$$\begin{array}{r} x + 7 \\ x-2 \overline{) x^2 + 5x - 14} \\ -(x^2 - 2x) \quad \\ \hline 7x - 14 \\ -(7x - 14) \\ \hline 0 \end{array}$$

$\boxed{x+7}$

2.) $(6x^2 - 5x + 9) \div (2x - 1)$

$$\begin{array}{r} 3x - 1 \\ 2x-1 \overline{) 6x^2 - 5x + 9} \\ -(6x^2 - 3x) \quad \\ \hline -2x + 9 \\ -(-2x + 1) \\ \hline 8 \end{array}$$

$\boxed{3x - 1 + \frac{8}{2x-1}}$

3.) $(5x^4 + 2x^3 - 9x + 12) \div (x^2 - 3x + 4)$

$$\begin{array}{r} 5x^2 + 17x + 31 \\ x^2-3x+4 \overline{) 5x^4 + 2x^3 + 0x^2 - 9x + 12} \\ -(5x^4 - 15x^3 + 20x^2) \qquad\qquad \\ \hline 17x^3 - 20x^2 - 9x \quad\; \\ -(17x^3 - 51x^2 + 68x + 12) \\ \hline 31x^2 - 77x + 12 \\ -(31x^2 - 93x + 124) \\ \hline 16x - 112 \end{array}$$

$\boxed{5x^2 + 17x + 31 + \frac{16x-112}{x^2-3x+4}}$

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

$$\begin{array}{r} 4x^2 + 12x + 44 \\ x^2-3x-2 \overline{) 4x^4 + 0x^3 + 0x^2 + 5x - 4} \\ -(4x^4 - 12x^3 - 8x^2) \qquad\qquad \\ \hline 12x^3 + 8x^2 + 5x \quad\; \\ -(12x^3 - 36x^2 - 24x) \quad\; \\ \hline 44x^2 + 29x - 4 \\ -(44x^2 - 132x - 88) \\ \hline 161x + 84 \end{array}$$

$\boxed{4x^2 + 12x + 44 + \frac{161x+84}{x^2-3x-2}}$

Divide using synthetic division.

5.) $(x^4 - 7x^2 + 9x - 10) \div (x - 2)$

$$\begin{array}{r|rrrrr} 2 & 1 & 0 & -7 & 9 & -10 \\ & \downarrow & 2 & 4 & -6 & 6 \\ \hline & 1 & 2 & -3 & 3 & \boxed{-4} \; R \end{array}$$

$\boxed{x^3 + 2x^2 - 3x + 3 + \frac{-4}{x-2}}$

6.) $(2x^2 - 11x^3 + 15x^2 + 6x - 18) \div (x - 3)$

$-11x^3 + 17x^2 + 6x - 18$

$$\begin{array}{r|rrrr} 3 & -11 & 17 & 6 & -18 \\ & \downarrow & -33 & -48 & -126 \\ \hline & -11 & -16 & -42 & \boxed{-144} \; R \end{array}$$

$\boxed{-11x^2 - 16x - 42 + \frac{-144}{x-3}}$

Given polynomial $f(x)$ and a factor of $f(x)$, factor $f(x)$ completely.

7.) $f(x) = x^3 - 3x^2 - 16x - 12$; $(x - 6)$

$$\begin{array}{r|rrrr} 6 & 1 & -3 & -16 & -12 \\ & \downarrow & 6 & 18 & 12 \\ \hline & 1 & 3 & 2 & \boxed{0} \end{array}$$

$(x-6)(x^2+3x+2)$

$\boxed{(x-6)(x+1)(x+2)}$

8.) $f(x) = 3x^3 - 16x^2 - 103x + 36$; $(x + 4)$

$$\begin{array}{r|rrrr} -4 & 3 & -16 & -103 & 36 \\ & \downarrow & -12 & 112 & -36 \\ \hline & 3 & -28 & 9 & \boxed{0} \end{array}$$

$3 \cdot 9 = 27$

$-27 \cdot -1 = -28$

$(x+4)(3x^2-28x+9)$

$(x+4)(3x^2-27x|-x+9)$

$(x+4)(3x(x-9)-1(x-9))$

$\boxed{(x+4)(x-9)(3x-1)}$

Given polynomial function f and a zero of f, find the other zeros of the function.

9.) $f(x) = 2x^3 + 3x^2 - 39x - 20$; zero: 4

$$\begin{array}{r|rrrr} 4 & 2 & 3 & -39 & -20 \\ & \downarrow & 8 & 44 & 20 \\ \hline & 2 & 11 & 5 & \boxed{0} \end{array}$$

$2 \cdot 5 = 10$

$10 + 1 = 11$

$(x-4)(2x^2+11x+5)=0$

$(x-4)(2x^2+10x+x+5)=0$

$(x-4)(2x(x+5)+1(x+5))=0$

$(x-4)(x+5)(2x+1)=0$

$\boxed{x=4}$ $\boxed{x=-5}$ $\boxed{x=-1/2}$

10.) $f(x) = x^3 - 9x^2 - 5x + 45$; zero: 9

$$\begin{array}{r|rrrr} 9 & 1 & -9 & -5 & 45 \\ & \downarrow & 9 & 0 & -45 \\ \hline & 1 & 0 & -5 & \boxed{0} \end{array}$$

$(x-9)(x^2-5)=0$

$\boxed{x=9}$ $x^2=5$

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

Find all real zeros of the function.

11.) $h(x) = x^3 + 4x^2 + x - 6$

$\pm 1, \pm 2, \pm 3, \pm 6$

$$\begin{array}{r|rrrr} 1 & 1 & 4 & 1 & -6 \\ & \downarrow & 1 & 5 & 6 \\ \hline & 1 & 5 & 6 & \boxed{0} \end{array}$$

$(x-1)(x^2+5x+6)=0$

$(x-1)(x+3)(x+2)=0$

$\boxed{x=1}$ $\boxed{x=-3}$ $\boxed{x=-2}$

12.) $g(x) = x^3 - 5x^2 - 18x + 72$

$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 9, \pm 12, \pm 18, \pm 24, \pm 36, \pm 72$

$$\begin{array}{r|rrrr} 3 & 1 & -5 & -18 & 72 \\ & \downarrow & 3 & -6 & -72 \\ \hline & 1 & -2 & -24 & \boxed{0} \end{array}$$

$(x-3)(x^2-2x-24)=0$

$(x-3)(x-6)(x+4)=0$

$\boxed{x=3}$ $\boxed{x=6}$ $\boxed{x=-4}$

Find all real zeros of the function.

13.) $f(x) = 2x^3 + 4x^2 - 2x - 4$

$\pm1, \pm2, \pm4, \pm\frac{1}{2}$

$$\begin{array}{r|rrrr} 1 & 2 & 4 & -2 & -4 \\ & \downarrow & 2 & 6 & 4 \\ \hline & 2 & 6 & 4 & \boxed{0} \end{array}$$

$2\cdot4=8$

$4+2=6$

$(x-1)(2x^2+6x+4)=0$

$(x-1)(2x^2+2x+4x+4)=0$

$(x-1)(2x(x+1)+4(x+1))=0$

$(x-1)(x+1)(2x+4)=0$

$\boxed{x=1}$, $\boxed{x=-1}$, $\boxed{x=-2}$

14.) $g(x) = 2x^3 - 5x^2 - 14x + 8$

$\pm1, \pm2, \pm4, \pm8, \pm\frac{1}{2}$

$$\begin{array}{r|rrrr} -2 & 2 & -5 & -14 & 8 \\ & \downarrow & -4 & 18 & -8 \\ \hline & 2 & -9 & 4 & \boxed{0} \end{array}$$

$2\cdot4=8$

$8+1=9$

$(x+2)(2x^2-9x+4)=0$

$(x+2)(2x^2-8x-x+4)=0$

$(x+2)(2x(x-4)-1(x-4))=0$

$(x+2)(x-4)(2x-1)=0$

$\boxed{x=-2}$ $\boxed{x=4}$ $\boxed{x=1/2}$

Find all zeros of the polynomial function.

15.) $f(x) = x^4 + 4x^3 + 7x^2 + 16x + 12$

$\pm1, \pm2, \pm3, \pm4, \pm6, \pm12$

$$\begin{array}{r|rrrrr} -1 & 1 & 4 & 7 & 16 & 12 \\ & \downarrow & -1 & -3 & -4 & -12 \\ \hline & 1 & 3 & 4 & 12 & \boxed{0} \end{array}$$

$x^3+3x^2+4x+12$

$$\begin{array}{r|rrrr} -3 & 1 & 3 & 4 & 12 \\ & \downarrow & -3 & 0 & -12 \\ \hline & 1 & 0 & 4 & \boxed{0} \end{array}$$

x^2+4

$(x+1)(x+3)(x^2+4)=0$

$\boxed{x=-1}$ $\boxed{x=-3}$

$x^2=-4$

$\boxed{x=\pm2i}$

16.) $g(x) = x^4 + 5x^3 - 7x^2 - 29x + 30$

$\pm1, \pm2, \pm3, \pm5, \pm6, \pm10, \pm15, \pm30$

$$\begin{array}{r|rrrrr} 1 & 1 & 5 & -7 & -29 & 30 \\ & \downarrow & 1 & 6 & -1 & -30 \\ \hline & 1 & 6 & -1 & -30 & \boxed{0} \end{array}$$

x^3+6x^2-x-30

$$\begin{array}{r|rrrr} 2 & 1 & 6 & -1 & -30 \\ & \downarrow & 2 & 16 & 30 \\ \hline & 1 & 8 & 15 & \boxed{0} \end{array}$$

$x^2+8x+15$

$(x-1)(x-2)$

$(x^2+8x+15)=0$

$(x-1)(x-2)$

$(x+5)(x+3)=0$

$\boxed{x=1}$ $\boxed{x=2}$

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

Write a polynomial function f of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros.

17.) $-3, -1, -2i$

$(x+3)(x+1)(x-2i)(x+2i)$

$(x^3+x+3x+3)(x^2+\cancel{2ix-2ix}-4i^2)$

$(x^2+4x+3)(x^2+4)$

$x^2(x^2+4x+3)+4(x^2+4x+3)$

$x^4+4x^3+3x^2+4x^2+16x+12$

$\boxed{x^4+4x^3+7x^2+16x+12}$

18.) $3,\ 2+\sqrt{3}$

$(x-3)(x-(2+\sqrt{3}))(x-(2-\sqrt{3}))$

$(x-3)((x-2)-\sqrt{3})((x-2)+\sqrt{3})$

$(x-3)((x-2)^2+\cancel{\sqrt{3}(x-2)-\sqrt{3}(x-2)}-\sqrt{9})$

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

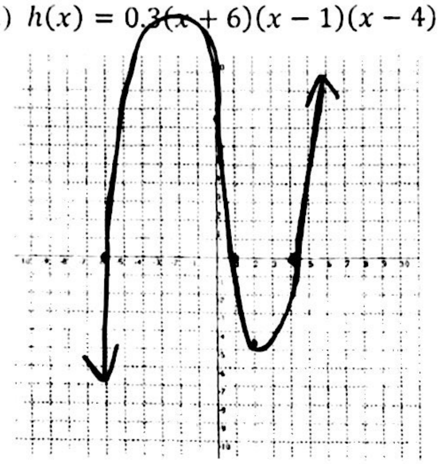
$(x-3)(x^2-4x+1)$

$x(x^2-4x+1)-3(x^2-4x+1)$

$x^3-4x^2+x-3x^2+12x-3$

$\boxed{x^3-7x^2+13x-3}$

19.) $h(x) = 0.3(x+6)(x-1)(x-4)$



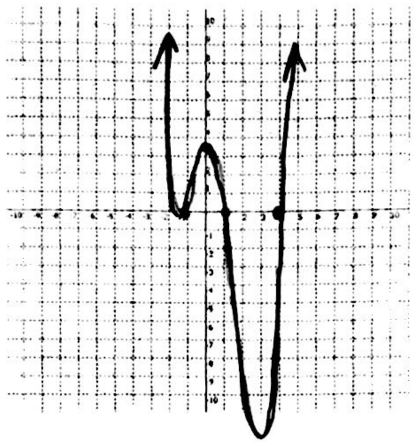
x-intercept(s): (-6,0) (1,0) (4,0)

y-intercept: (0, 7.2)

x	-7	-5	-4	-1	2	3	5	
y	-26.4	16.2	24	15	-4.8	-5.4	13.2	

20.) $f(x) = \frac{5}{6}(x+1)^2(x-1)(x-4)$

repeated zero



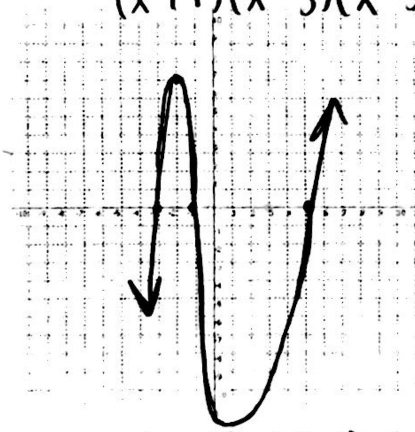
x-intercept(s): (-1,0) (1,0) (4,0)

y-intercept: (0, 3.3)

x	-2	2	3		5			
y	15	-15	-26.7		120			

21.) $h(x) = x^3 - x^2 - 17x - 15$

$(x+1)(x-5)(x-3)$



x-intercept(s): (-1,0) (5,0) (-3,0)

y-intercept: (0,-15)

x	-4	-2	1	2	3	4	6	
y	-27	7	-32	-45	-48	-35	63	

$\pm 1, \pm 3, \pm 5, \pm 15$

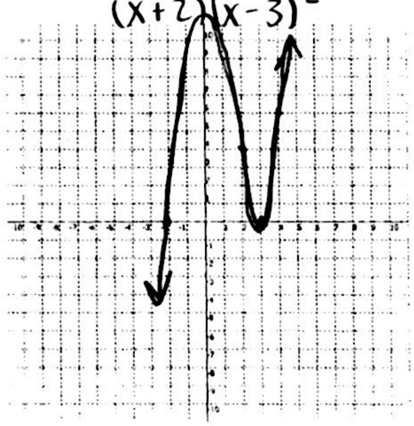
$(x+1)(x^2-2x-15)$

$(x+1)(x-5)(x+3)$

$$\begin{array}{r|rrrr} -1 & 1 & -1 & -17 & -15 \\ & \downarrow & -1 & 2 & 15 \\ \hline & 1 & -2 & -15 & \boxed{0} \end{array}$$

22.) $f(x) = x^3 - 4x^2 - 3x + 18$

$(x+2)(x-3)^2$



x-intercept(s): (-2,0) (3,0)

y-intercept: (0,18)

x	-3	-1	1	2	4	5		
y	-36	16	12	4	6	28		

$\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18$

$$\begin{array}{r|rrrr} -2 & 1 & -4 & -3 & 18 \\ & \downarrow & -2 & 12 & -18 \\ \hline & 1 & -6 & 9 & \boxed{0} \end{array}$$

$(x+2)(x^2-6x+9)$

$(x+2)(x-3)^2$