SM3 Filled in Notes Name _____ Pd _____

1.1 - Linear Polynomials and Graphing Linear Using a Table

A. Vocabulary

Monomial: An expression that is a number, a variable, or numbers and variables multiplied together. Monomials only have variables with whole number exponents and never have variables in the denominator of a fraction or variables under roots.

Monomials: $6x^4$, 8, xy, $-5xy^3$

Not Monomials: $\frac{4}{z^2}$ ← letter in denominator, $6\sqrt{x}$, w^{-4}, $a^{2/3}$

Polynomial: A monomial or several monomials joined by + or – signs.

any # of terms $6x^4-2x^3+3x+4$

Vocabulary:

Constant: 8, −4

Coefficient: $3x^4$ ← # in front

Degree: $-2x^5$ ← biggest exponent $x^0=1$ $x^1=x$

Terms: Seperated by + or − signs

Like Terms: Have to have same letters and same exponents
* you can add like terms

Binomial: 2 terms

Trinomials: 3 terms

Standard Form: start w/biggest exponent and go down.

$2x^4-5x^3+7x^2-x+3$

Examples: 1) Decide whether each expression is a polynomial. If it isn't, explain why not.
2) Write each expression in standard form.

a) $2x^3+6x+5x^4$ yes $5x^4+2x^3+6x$

b) $-\frac{4}{3}a-a^5$ same as $\frac{-4a}{3}-a^5$ $-a^5-\frac{4a}{3}$

c) $\frac{12}{m+2}$ NO letter in denominator

d) $6c^{-2}+c-1$ no negative exponent

e) $6z^{\frac{1}{2}}+5z^2-2$ no fractional exponent

f) 7 yes 7

g) $-8n-3$ yes $-8n-3$

h) $3\sqrt{x+2}$ no variable under $\sqrt{}$

Subtract means add the opposite

B. Adding and Subtracting Polynomials

To add or subtract polynomials, combine like terms. Add or subtract the coefficients. The variables and exponents do not change. ***Remember to subtract everything inside the parentheses after a minus sign.*** Subtract means "add the opposite," so change the minus sign to a plus sign and then change the signs of all the terms inside the parentheses.

* answers in standard form

Examples: Simplify each expression and for ***a,b,*** and ***c*** write in slope-intercept form.

a) $(5n-2)+(7-3n)$

$2n+5$

b) $(4x+1)+(-2x+5x-6)$

$7x-5$

c) $(u-4)+(2+5u)+(7u+8)$

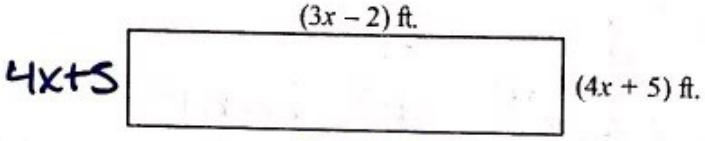
$-u-14$

d) $(6mn+5m)+(4m+2mn)+(3mn-7m)$

$11mn-6m$

e) Find the perimeter in terms of x.

add all sides



$4x+5+4x+5+3x-2+3x-2$

$(14x+6)$ ft

C. Solve each story

a) Maribel mows lawns. She charges 6 dollars per lawn plus and hourly rate of 10 dollars. If it takes her an hour and a half to mow your lawn how much should she charge you?

C how much charges
x how many hours

$C = 6 + 10x$

$C = 6 + 10(1.5)$

$C = \$21$

b) This soccer season, Dakota scored 4 more than twice the number of goals he scored last season. He scored 7 goals last season. How many goals did he score this season?

G goals this season
L goals last season

$G = 4 + 2L$

$G = 4 + 2(7)$

$G = 18$ goals

D. Slope-intercept form

Rewrite equations in slope-intercept form by solving for y. Leave answers as simplified fractions.

a) $2x-7y=21$

$-2x \quad -2x$

$\frac{-7y}{-7} = \frac{+2x}{+7} + \frac{21}{-7} + 3$

$y = \frac{2x}{7} - 3$

b) $y-\frac{3}{2}=5(x-2)$

$y - \frac{3}{2} = 5x - 10$

$+\frac{3}{2} \quad +\frac{3}{2}$

$y = 5x - \frac{17}{2}$

slope intercept form

$y = mx + b$

slope, y int

PEMDAS ← Remember

E. Solve for y given x and Evaluate functions

Solve for y given the value of x. Leave answer as a fraction.

a) $y=-4x+7$ for $x=-2$

$y=-4(-2)+7$

$8+7$

$\boxed{y=15}$

b) $6x-9y=30$ for $x=3$

$6(3)-9y=30$

$18-9y=30$

$-18 \quad -18$

$\frac{-9y}{-9}=\frac{12}{-9}$ → $\frac{4}{3}$

$\boxed{y=-\frac{4}{3}}$

Evaluate each function. Leave answer as a fraction.

a) $f(x)=\frac{1}{4}x-5, \quad f(3)$

$f(3)=\frac{1}{4}\cdot\frac{3}{1}-5$

$=\frac{3}{4}-5=\boxed{\frac{-17}{4}}$

b) $f(x)=9x+2, \quad f\left(\frac{1}{2}\right)$

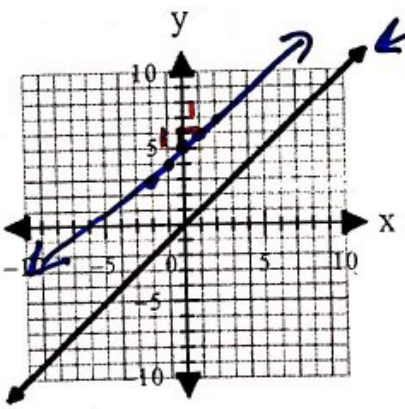
$f\left(\frac{1}{2}\right)=\frac{9}{1}\cdot\frac{1}{2}+2$

$=\left(\frac{9}{2}\right)+2=\boxed{\frac{13}{2}}$

F. Graph Linear Equations Using a Table

$y=1x+5$ ← slope, y-int

x	$f(x)=x+5$ $y=x+5$	$f(x)$ y	$(x, f(x))$
-2	$-2+5$	3	$(-2,3)$
-1	$-1+5$	4	$(-1,4)$
0	$0+5$	5	$(0,5)$
1	$1+5$	6	$(1,6)$
2	$2+5$	7	$(2,7)$



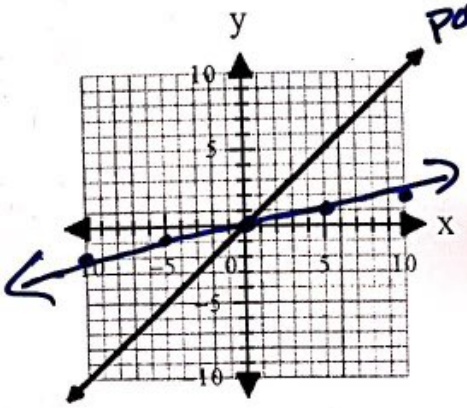
← parent graph $y=x$

Slope: 1 $\quad$ slope = $\frac{\text{rise}}{\text{run}}=\frac{1}{1}=1$

y-intercept: 5

$y=\frac{1}{5}x+0$

x	$f(x)=\frac{1}{5}x+0$	$f(x)$ y	$(x, f(x))$
-15	$\frac{1}{5}\cdot\frac{-15}{1}=-3$	-3	$(-15,-3)$
-10	$\frac{1}{5}\cdot\frac{-10}{1}=-2$	-2	$(-10,-2)$
-5	$\frac{1}{5}\cdot\frac{-5}{1}=-1$	-1	$(-5,-1)$
0	$\frac{1}{5}\cdot 0=0$	0	$(0,0)$
5	$\frac{1}{5}\cdot\frac{5}{1}=1$	1	$(5,1)$
10	$\frac{1}{5}\cdot\frac{10}{1}=2$	2	$(10,2)$
15	$\frac{1}{5}\cdot\frac{15}{1}=3$	3	$(15,3)$



parent graph $y=x$

Slope: $\frac{1}{5}$

y-intercept: 0

1.2 Notes - Quadratic Polynomials and Graphing Quadratic Polynomials using a Table

A. List all the parts of the polynomial.

1. $-9+4x^2-3x$

Standard form: $4x^2-3x-9$

All coefficients: $4, -3, -9$

Degree of the polynomial: 2

Leading coefficients: 4

Constant: -9

Type of equation: Quadratic

B. Simplify Quadratic Polynomials by adding and subtracting.

1. $(5n^2-2)+(7-3n^2)$

$2n^2+5$

2. $(4x^2-3x+1)+(-2x^2+5x-6)$

$2x^2+2x-5$

3. $(6m^2+5m)+(4m^2+2m)+(3m^2-7m)$

$5m^2$

4. $(3cd^2-3c)+(7cd^2+2d)+(8cd^2+5d)$

$-12cd^2-5c-7d$

C. Multiply Polynomials using the distributive property. Simplify and write answers in standard form.

1. $-5w(w-3)$

FOIL

$-5w^2+15w$

2. $(m+3)(m-8)$

FOIL

$m^2-8m+3m-24$

$m^2-5m-24$

3. $(3x+1)(5x-2)$

$15x^2-6x+5x-2$

$15x^2-x-2$

4. $(2x-3)^2$ rewrite it $(2x-3)(2x-3)$

FOIL

$4x^2-6x-6x+9$

$4x^2-12x+9$

5. $(5y-2)(5y+2)$

FOIL

$25y^2+10y-10y-4$

$25y^2-4$

6. $-2(x-4)+4(3x-1)$

$-2x+8+12x-4$

$10x+4$

7. Find the area of the rectangle in terms of x. Write answer in standard form.

$(3x+2)$ ft.

$(4x-8)$ ft.

$\text{Area}_{\square} = L \cdot W$

$(4x-8)(3x+2)$

$12x^2+8x-24x-16$

$12x^2-16x-16$

D. Solve for y.

1. $-4x^2 - 9y = 27$

$+4x^2 \quad +4x^2$

$\frac{-9y}{-9} = \frac{4x^2}{-9} + \frac{27}{-9}$

$y = -\frac{4x^2}{9} - 3$

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

FOIL

$(x-4)(x-4)$

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

$y - 2 = \frac{3}{4}(x^2 - 8x + 16)$

$\frac{+3}{4} \cdot \frac{-8}{1}$

$\frac{3}{4} \cdot \frac{16}{1}$

$y - 2 = \frac{3}{4}x^2 - 6x + 12$

$+2 \quad +2$

$y = \frac{3}{4}x^2 - 6x + 14$

E. Solve for y given the value of x.

PEMDAS

1. $y = 4x^2 + 3$ for $x = -2$

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

$y = 19$

2. $-5y - x^2 = 18$ for $x = 3$

$-5y - (3)^2 = 18$

$-5y - 9 = 18$

$+9 \quad +9$

$\frac{-5y}{-5} = \frac{27}{-5}$

$y = -\frac{27}{5}$

F. Evaluate functions.

1. $f(x) = 5x^2 - 4, \; f\left(\frac{1}{5}\right)$

$f\left(\frac{1}{5}\right) = 5\left(\frac{1}{5}\right)^2 - 4$

$5 \cdot \frac{1}{25} - 4$

$\frac{1}{5} - \frac{4}{1} \cdot \frac{5}{5}$

$\frac{-19}{5}$

2. $f(x) = \frac{1}{4}x^2 + 1, \; f(8)$

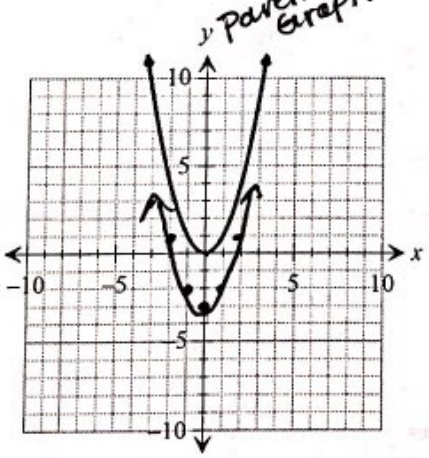
G. Make a table for each equation. Graph each equation.

1. $f(x) = x^2 - 3$

$f(x) = x^2$ parent graph

x	$f(x) = x^2 - 3$	$f(x)$
-2	$f(-2) = (-2)^2 - 3$	1
-1	$f(-1) = (-1)^2 - 3$	-2
0	$f(0) = 0^2 - 3$	-3
1	$f(1) = (1)^2 - 3$	-2
2	$f(2) = 2^2 - 3$	1

(-2, 1) (-1, -2) (0, -3) (1, -2) (2, 1)

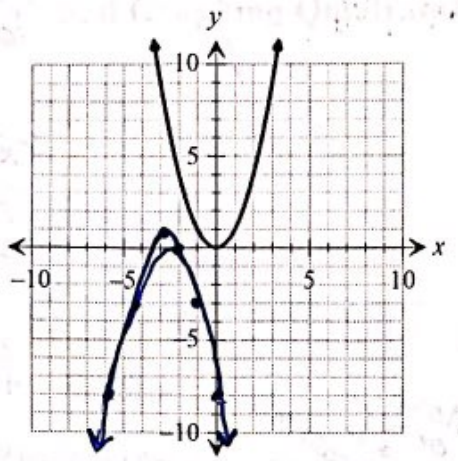


What does the -3 do to the graph when compared to the parent graph $y = x^2$?

down 3

2. $f(x) = -(x+3)^2 + 1$ (flipped, opposite)

x	$f(x) = -(x+3)^2 + 1$	$f(x)$
-2	$f(-2) = -1(-2+3)^2 + 1$	0
-1	$f(-1) = -1(-1+3)^2 + 1$	-3
0	$f(0) = -1(0+3)^2 + 1$	-8
1	$f(1) = -1(1+3)^2 + 1$	-15
2	$f(2) = -1(2+3)^2 + 1$	-24



What does the negative(-) do to the graph when compared to the parent graph $y = x^2$?

reflected over x-axis

What does the +3 do to the graph when compared to the parent graph $y = x^2$?

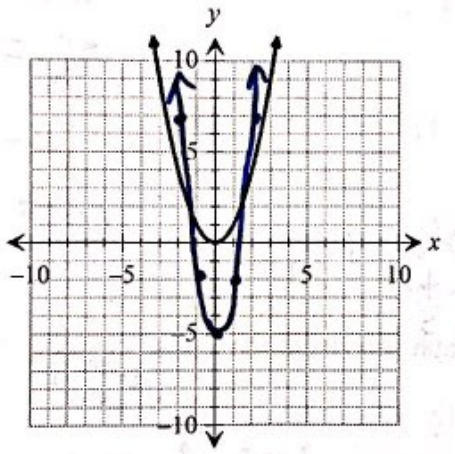
left 3

What does the +1 do to the graph when compared to the parent graph $y = x^2$?

up 1

3. $f(x) = 3x^2 - 5$

x	$f(x) = 3x^2 - 5$	$f(x)$
-2	$3(-2)^2 - 5$	7
-1	$3(-1)^2 - 5$	-2
0	$3(0)^2 - 5$	-5
1	$3(1)^2 - 5$	-2
2	$3(2)^2 - 5$	7



What does the 3 do to the graph when compared to the parent graph $y = x^2$?

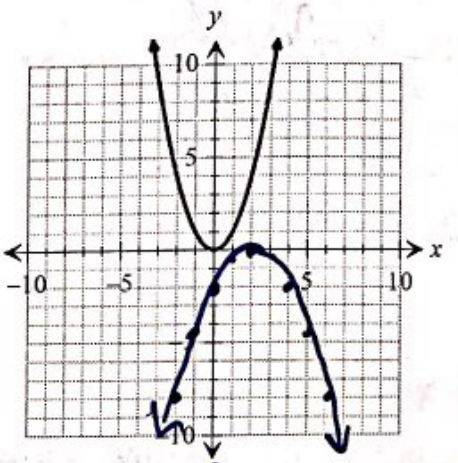
vertical stretch of 3

What does the -5 do to the graph when compared to the parent graph $y = x^2$?

down 5

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

x	$f(x) = -\frac{1}{2}(x-2)^2$	$f(x)$
-2	$-\frac{1}{2}(-2-2)^2$	-8
-1	$-\frac{1}{2}(-1-2)^2$	$-\frac{9}{2}$
0	$-\frac{1}{2}(0-2)^2$	-2
1	$-\frac{1}{2}(1-2)^2$	$-\frac{1}{2}$
2	$-\frac{1}{2}(2-2)^2$	0



graph is symmetrical

What does the negative(-) do to the graph when compared to the parent graph $y = x^2$?

reflect over x axis

What does the $\frac{1}{2}$ do to the graph when compared to the parent graph $y = x^2$?

vertical shrink by $\frac{1}{2}$

What does the -2 do to the graph when compared to the parent graph $y = x^2$?

Right 2

1.3 Notes – Cubic Polynomials, Graphing Cubics, and Combining Functions

A. Simplify and write in standard form.

1. $(5n^2+3)+(7n^3-4)$

$7n^3+5n^2-1$

2. $(3x-12x^3)+(6x^3+1+10x)$

$-18x^3-7x+1$

3. $(5w^3+9w^2)+(+2+4w^3)+(-8-1w^3)$

$9w^2-6$

4. $(a^3+8ab-5b^2)+(-4a^3-4ab+b^2)$

$-3a^3+4ab-4b^2$

B. Multiply each polynomial using the distributive property. Write answers in standard form.

1. $-3h(-2h^2-9h+4)$

$6h^3+27h^2-12h$

2. $(b-5)(3b^2+b-6)$

$3b^3+b^2-6b$

$-15b^2-5b+30$

$3b^3-14b^2-11b+30$

3. $(4x^2-2y)(x+9y)$ FOIL

$4x^3+36x^2y-18y^2-2xy$

4. $(4z-3)^3$ rewrite it

$(4z-3)(4z-3)(4z-3)$

FOIL

$16z^2-12z-12z+9$

$(16z^2-24z+9)(4z-3)$ Distributive Property

$64z^3-48z^2$

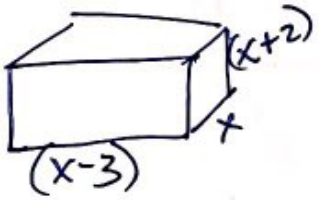
$-96z^2+72z$

$36z-27$

$64z^3-144z^2+108z-27$

C. Volume

1. Find the volume of the rectangular prism with a length of $(x-3)$ft., a width of (x)ft., and a height of $(x+2)$ft. Leave your answer in terms of x.



FOIL

$(x-3)(x+2)\,x$

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

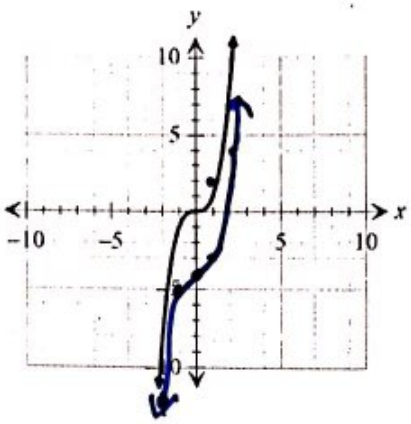
$x(x^2-x-6)$

x^3-x^2-6x

D. Graph each cubic equation by making a table.

1. $f(x) = x^3 - 4$

x	$f(x) = x^3 - 4$	$f(x)$
-2	$(-2)^3 - 4$	-12
-1	$(-1)^3 - 4$	-5
0	$(0)^3 - 4$	-4
1	$(1)^3 - 4$	-3
2	$(2)^3 - 4$	4

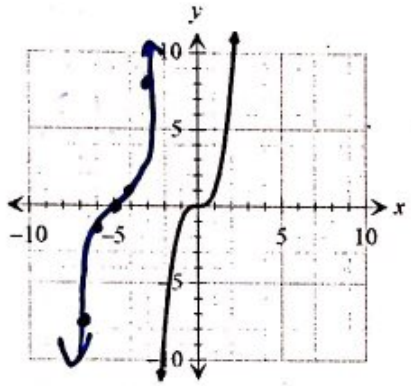


What does the -4 do to the graph when compared to the parent graph? $y = x^3$

Down 4

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

x	$f(x) = (x+5)^3$	$f(x)$
-7	$(-7+5)^3$	-8
-6	$(-6+5)^3$	-1
-5	$(-5+5)^3$	0
-4	$(-4+5)^3$	1
-3	$(-3+5)^3$	8



What does the +5 do to the graph when compared to the parent graph? $y = x^3$

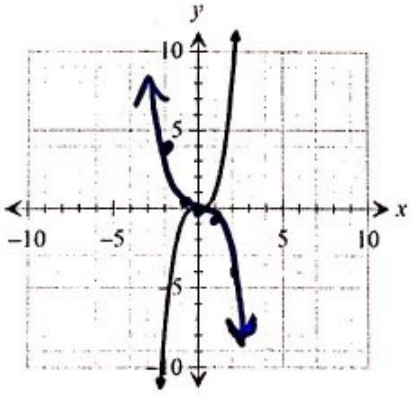
Left 5

What would happen to the parent graph $y = x^3$ if the 5 was negative?

Right 5

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

x	$f(x) = -\frac{1}{2}x^3$	$f(x)$
-2	$-\frac{1}{2}(-2)^3$	4
-1	$-\frac{1}{2}(-1)^3$	1/2
0	$-\frac{1}{2}(0)^3$	0
1	$-\frac{1}{2}(1)^3$	-1/2
2	$-\frac{1}{2}(2)^3$	-4



What does the negative do to the graph when compared to the parent graph? $y = x^3$

reflect over x-axis

What does the $\frac{1}{2}$ do to the graph when compared to the parent graph? $y = x^3$

vertical shrink by 1/2

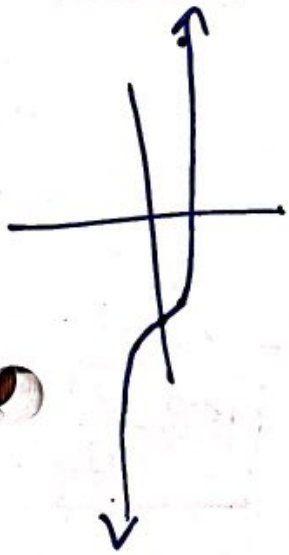
What would happen to the parent graph $y = x^3$ if the coefficient was a whole number instead of a fraction?

vertical stretch

E. State whether the table is linear, quadratic, or cubic.

1. Cubic

x	f(x)
-2	-22
-1	-8
0	-6
1	-4
2	10



2. Linear

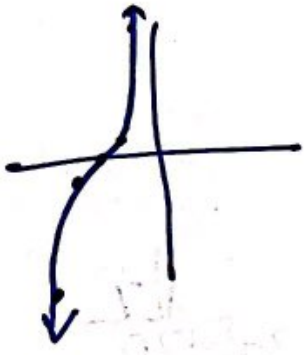
X	f(x)	
-2	5	−2
-1	3	−2
0	1	−2
1	-1	−2
2	-3	−2

3. Quadratic

x	f(x)
-2	-3
-1	0
0	1
1	0
2	-3

4. Cubic

x	f(x)
-6	-8
-5	-1
-4	0
-3	1
-2	8



1.4 Notes – Long Division

1. Review

a. $3x^2(2x-1)$

$6x^3-3x^2$

b. $(x^2+6x-10)+(3x^2+6x+5)$

$-2x^2+12x-15$

c. $x \cdot \square = 4x^3$ $\square = 4x^2$

d. $5x \cdot \square = 20x^4$ $\square = 4x^3$

e. $2x \cdot \square = -2x^3$ $\square = -1x^2$

2. Long Division Practice with No Calculator

a. $420 \div 24$

$$24\overline{)420}\quad 17$$

$24 \times 7 = 168$

$420 - 168 = 12$

$17\frac{12}{24}$ or $17\frac{1}{2}$

b. $2995 \div 22$

$$22\overline{)2995}\quad 136$$

$22 \times 6 = 132$

$2995 - 132 = 3$

$136\frac{3}{22}$

c. $6669 \div 42$

$$42\overline{)6669}\quad 158$$

$42 \times 8 = 336$

$6669 - 336 = 33$

$158\frac{33}{42}$

d. $4669 \div 62$

$$62\overline{)4669}\quad 75$$

$62 \times 7 = 434$

$4669 - 434 = 19$

$75\frac{19}{62}$

e. $9853 \div 63$

$$63\overline{)9853}\quad 156$$

$63 \times 6 = 378$

$9853 - 378 = 25$

$156\frac{25}{63}$

f. $8524 \div 56$

$$56\overline{)8524}\quad 152$$

$56 \times 5 = 280$

$8524 - 280 = 124$

$56 \times 2 = 112$

$124 - 112 = 12$

$152\frac{12}{56}$

OR

Simplify $152\frac{3}{14}$

3. Things to remember when dividing polynomials:

a. Just like long division with numbers

b. Must be in Standard form

c. Add a zero in place of any missing term.

d. Remainders

3. Examples:

a. $\frac{x^2-9x-10}{x+1}$

$$x+1 \overline{)\, x^2-9x-10}$$

$x - 10$

$-x^2 + x$ ↓ ← subtract (change signs)

$-10x - 10$

$+10x + 10$

0

$x-10$

b. $\frac{3x^3-5x^2+10x-3}{3x+1}$

$$3x+1 \overline{)\, 3x^3-5x^2+10x-3}$$

$x^2 - 2x + 4$

$-3x^3 + x^2$ ↓

$-6x^2 + 10x$ ↓

$+6x^2 + 2x$ ↓

$12x - 3$

$-12x + 4$

-7

$x^2-2x+4 - \frac{7}{3x+1}$

c. $(2x^3-9x^2+15)\div(2x-5)$

$$2x-5 \overline{)\, 2x^3-9x^2+0x+15}$$

$x^2 - 2x - 5$

$-2x^3 + 5x^2$

$-4x + 0x$

$+4x + 10x$

$-10x + 15$

$+10x + 25$

-10

$x^2-2x-5 - \frac{10}{2x-5}$

d. $(1+2x+3x^3+4x^4)\div(x^2+x+2)$

$$x^2+x+2 \overline{)\, 4x^4+3x^3+0x^2+2x+1}$$

$4x^2 - x - 7$

$-4x^4 + 4x^3 + 8x^2$

$-x^3 - 8x^2 + 2x$

$+x^3 + x^2 + 2x$

$-7x^2 + 4x + 1$

$+7x^2 + 7x + 14$

$11x + 15$

$4x^2-x-7 + \frac{11x+15}{x^2+x+2}$

1.5 Combining Functions

1) Review

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

x^3-3x^2+3x-9

add like terms

b) $(x-6)(5x+2)$ FOIL

$5x^2+2x-30x-12$

$5x^2-28x-12$

c) $\frac{x^2+8x-5}{x-2}$

$$x-2\overline{)\,x^2+8x-5}$$

$x+10$

$-x^2+2x$

$10x-5$

$-10x+20$

15

$x+10+\frac{15}{x+10}$

2) Find an ***algebraic expression*** for ***r(x)*** using the given functions. ***Simplify*** if possible.

Examples: Let $f(x)=3x-5$, $g(x)=x^2+5x-2$ and $h(x)=\sqrt{x}-1$. Perform the indicated operations.

* write answers in standard form

a) $r(x)=(f+g)(x)$ $=f(x)+g(x)$

$r(x)=(3x-5)+(x^2+5x-2)$

$r(x)=x^2+8x-7$

b) $r(x)=(f-g)(x)$ $=f(x)-g(x)$

$r(x)=(3x-5)+(-x^2-5x+2)$

$r(x)=-x^2-2x-3$

c) $r(x)=(gh)(x)$ $=g(x)\cdot h(x)$ multiply

$r(x)=(x^2+5x-2)(\sqrt{x}-1)$

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

d) $r(x)=\left(\frac{f}{h}\right)(x)$ $=\frac{f(x)}{h(x)}$ Divide

$r(x)=\frac{3x-5}{\sqrt{x}-1}$

3) Evaluate each of the following using the given functions. **SHOW WORK!**

Examples: Let $f(x)=\sqrt{x-2}$, let $g(x)=-x^2+3$, and $h(x)=\frac{x}{x-4}$. Evaluate the following.

a) $f(2)+g(1)$

$(\sqrt{2-2})+(-(1)^2+3)$

$(-1+3)$

$0+2=\boxed{2}$

b) $f(3)-g(-3)$

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

$-9+3$

$1+(+6)=\boxed{7}$

c) $f(6)\cdot 3h(2)$

$(\sqrt{6-2})\cdot 3\left(\frac{2}{2-4}\right)$

$\sqrt{4}$

$\frac{2}{-2}$

$2\cdot 3\cdot -1=\boxed{-6}$

d) $\frac{-2g(5)}{h(-1)}$

$=\frac{-2(-(5)^2+3)}{\frac{-1}{-1-4}}$

$-25+3$

$=\frac{-2(-22)}{\frac{+1}{+5}}=\frac{44}{\frac{1}{5}}$

$44\div\frac{1}{5}$

$44\cdot 5$

$=\boxed{220}$

4) Find the indicated *composition function* and its ***domain*** using the given functions. **SHOW WORK!**

Examples: Let $f(x)=3x-5$, $g(x)=\sqrt{x}$, $h(x)=x^2-4$, and $k(x)=\frac{2}{x-2}$.

a) $r(x)=(f\circ g)(x)$ $=f(g(x))=f(\sqrt{x})$

Plug $g(x)$ into function f

$\boxed{r(x)=3\sqrt{x}-5}$

b) $r(x)=(f\circ f)(x)$ $=f(f(x))=f(3x-5)$

Plug $f(x)$ into function f

$r(x)=3(3x-5)-5$

$r(x)=9x-15-5$

$\boxed{r(x)=9x-20}$

c) $r(x)=(k\circ g)(x)$ $=K(g(x))=K(\sqrt{x})$

$\boxed{r(x)=\frac{2}{\sqrt{x}-2}}$

d) $r(x)=(k\circ k)(x)$ $=K(k(x))=K\left(\frac{2}{x-2}\right)$

$\boxed{r(x)=\frac{2}{\frac{2}{x-2}-2}}$

e) $r(x)=(h\circ g)(x)$ $=h(g(x))=h(\sqrt{x})$

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

$\boxed{r(x)=x-4}$