Date:_____ **UNIT 1: ALGEBRAIC & NUMERICAL EXPRESSIONS**

1.1 Adding, Subtracting, and Multiplying Polynomials

1. Simplify.

a) $(3x^2+7x+1)+(2x^2-3x-5)$

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

c) $\sqrt{25x^6}-6y^2+\sqrt{x^2y^2}-7x^3-\sqrt{9y^4}$

d) $\sqrt{49(x-2)^2}-\sqrt{(3x+1)^2}$

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

f) $2[2(4x+3)-2(x-1)]$

2. Expand and simplify.

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

b) $-2(x+3y)(2x-y)$

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

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

HW. Exercise 1.1

Date:_____ **1.2 Review of Factoring Techniques**

"When factoring always look for the *greatest common factor* first."

Common Factoring

1. Factor.

a) $-9x+6xy$

b) $8x^2y^3-6x^3y^3+2x^2y$

Difference of Squares $a^2-b^2=(a-b)(a+b)$ or $a^2-b^2=\left(\sqrt{a^2}-\sqrt{b^2}\right)\left(\sqrt{a^2}+\sqrt{b^2}\right)$

2. Factor completely.

a) $4x^2-1$

b) $36x^2-25y^4$

c) $81-a^4$

d) $-3a^7b^4+48a$

Simple Trinomials $ax^2+bx+c,\ a=1$ ***or*** $ax^4+bx^2+c,\ a=1$

3. Factor completely.

a) $x^2+8x+12$

b) $x^2-3xy-28y^2$

c) $-2y^3-14y^2+36y$

d) x^4-10x^2+9

Tricky Trinomials $ax^2+bx+c,\ a\neq 1$ ***or*** $ax^4+bx^2+c,\ a\neq 1$

4. Factor completely.

a) $3x^2+x-10$

b) $5x^2-11x-12$

c) $4a^2-20ab+25b^2$

d) $4y^2+23y+15$

e) $12x^4+34x^3-28x^2$

f) $2u^4-13u^2+20$

HW. Exercise 1.2

Date:_____ **1.3 Factoring by Substitution and Grouping**

Warm-up:

Factor completely. ***(Remember to always look for a greatest common factor first.)***

a) $-9x^2+18x-9$ **b)** x^4-3x^2-4

c) $4x^2+15xy-4y^2$ **d)** $12m^3-46m^2-36m$

Factoring by Substiution

1. Factor completely using the method of ***substitution***.

a) $6x(x+1)-2(x+1)$ **b)** $(x+2)^2-6(x+2)+8$

c) $(x^2+2x)^2-2(x^2+2x)-3$ **h)** $9(3x+1)^2-(x-5)^2$

Factoring by Grouping

2. Factor the following by ***grouping***.

a) $5x^3-10x^2-3x+6$ **b)** $2x^3+8x^2+x+4$

c) $x^4+6x^2+9-4y^4$ **d)** $x^2-y^2+14y-49$

HW. Exercise 1.3

Date:_____ **1.4 Solving Quadratic Equations by Factoring**

Recall: *Every quadratic equation of the form* $ax^2 + bx + c = 0$ *is of the* 2^{nd} *degree and has 2 roots.*

1. Solve each of the following for *x* by factoring.

a) $9x^2 - 25y^2 = 0$

b) $-3x + 6x^2 = 0$

c) $x^2 - 4x = 12$

d) $2x^2 = 15 - 7x$

e) $-9x^2 = 16 + 24x$

f) $18xy - 18y^2 + 8x^2 = 0$

2. Solve.

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

b) $2t(3-t) = 3t + 7 - 4(t-1)^2$

HW. Exercise 1.4
Unit 1 Part I Test covers Days 1 to 4
HW. Part I Review 1.1 to 1.4

Date:_____ **1.5 Simplifying Rational Expressions**

Definition: A **rational expression** is of the form $\frac{f}{g}$, where f and g are polynomials and $g \neq 0$.

To simplify rational expressions: ***i)*** *factor the numerators and denominators fully*
ii) *state any restrictions on the variables in the denominators*
iii) *reduce*

1. Simplify each of the following. State any restrictions on the variables.

a) $\frac{3a^3b^2c}{-9ab^5c^2}$

b) $\frac{x(x-5)(2x+4)}{(x^2+2x)(2x-3)}$

2. Simplify each of the following. State any restrictions on the variables.

a) $\frac{20x^3+5x^2-10x}{5x}$

b) $\frac{4x^2-4x-15}{4x^2+16x+15}$

c) $\frac{3y-2x}{4x-6y}$

d) $\frac{9y^2-6y+1}{9y^2-21y+6}$

e) $\frac{x^2-2xy-8y^2}{16y^2-x^2}$

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

HW. Exercise 1.5

Date:_____ **1.6 Multiplying and Dividing Rational Expressions**

Rules: ***i)*** *express as a product* ***ii)*** *factor the numerators and denominators fully*
iii) *state restrictions on the variables* ***iv)*** *reduce*

Ex. Simplify and state restrictions on the variables.

a) $\frac{12x^3}{7y^4} \times \frac{14y^2}{8x^2} \div 2x^2$

b) $\frac{63a^3c^2}{45ab^2} \div \frac{36a^2bc^4}{-15ab^3c}$

c) $\frac{6x-3x^2}{4x+20} \div \frac{9x^2-18x}{3x+15}$

d) $\frac{2x+6y}{x^2+7xy+10y^2} \times \frac{x^2+3xy-10y^2}{x^2-4y^2}$

e) $\frac{2a^2+a-15}{6a^2+3a} \div \frac{a^3-9a}{2a^2-5a-3} \div \frac{6a^2-11a-10}{3a^2+5a+2}$

HW. Exercise 1.6

Date:_____ **1.7 Adding and Subtracting Rational Expressions**

Rules: ***i)*** *fully factor the numerators and denominators of each rational expression stating restrictions on the variables and reducing if possible*

ii) *find the lowest common denominator (LCD) and rewrite each rational expression with the LCD as the denominator for each, and then add or subtract numerators*

iii) *simplify the resulting rational expression , if possible*

Ex. 1. Simplify and state any restrictions on the variables.

a) $\frac{2x-3}{2x}+\frac{1-4x^3}{4x^3}-\frac{5-9x}{6x^2}$

b) $\frac{ab^2+2}{2ab^2}-\frac{b+2}{2b}+2$

c) $\frac{x+4}{x-3}+\frac{4x-5}{3-x}$

d) $\frac{2-5x}{x^2-4x+4}-\frac{6x^2-13x-5}{2x^2-9x+10}$

Ex. 2. Simplify and state any restrictions on the variables.

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

b) $\dfrac{\dfrac{1}{4+m}-\dfrac{1}{4}}{m}$

c) $\dfrac{21}{x^2+7x+10}-\dfrac{x^2+x-12}{x^2-2x-24}\div\dfrac{x^2+2x-15}{x^2-8x+12}$

HW. Exercise 1.7

Date:_____

1.8 Working With Radicals, I

Rules: *When* ***multiplying*** *radicals,* $\sqrt{a}\times\sqrt{b}=\sqrt{ab}$**.** *When* ***dividing*** *radicals,* $\dfrac{\sqrt{a}}{\sqrt{b}}=\sqrt{\dfrac{a}{b}}$.

Recall:

$\sqrt{4}$	$\sqrt{9}$	$\sqrt{16}$	$\sqrt{25}$	$\sqrt{36}$	$\sqrt{49}$	$\sqrt{64}$	$\sqrt{81}$	$\sqrt{100}$	$\sqrt{121}$	$\sqrt{144}$
$=2$	$=3$	$=4$	$=5$	$=6$	$=7$	$=8$	$=9$	$=10$	$=11$	$=12$

A. Changing Entire Radicals to Mixed Radicals

1. Simplify.

a) $\sqrt{50}$ **b)** $\sqrt{20}$ **c)** $\sqrt{54}$ **d)** $\sqrt{48}$

B. Dividing Radicals

2. Simplify.

a) $\dfrac{\sqrt{48}}{\sqrt{6}}$ **b)** $\dfrac{\sqrt{225}}{\sqrt{3}}$ **c)** $\dfrac{2\sqrt{5}}{\sqrt{180}}$ **d)** $\dfrac{-10\sqrt{216}}{2\sqrt{3}}$

C. Multiplying Radicals

3. Simplify.

a) $2\sqrt{3}\times5\sqrt{6}$ **b)** $9\sqrt{2}\times4\sqrt{14}$ **c)** $3\sqrt{7}\times5\sqrt{7}$

D. Simplifying Radical Expressions

4. Simplify.

a) $\dfrac{21-14\sqrt{6}}{7}$ **b)** $\dfrac{6-\sqrt{45}}{-3}$ **c)** $\dfrac{-15+2\sqrt{125}}{10}$

HW. Exercise 1.8

Date:_____ **1.9 Working With Radicals, II**

A. Adding and Subtracting Radicals

1. Simplify (ie. add and subtract ***like*** radicals).

a) $\sqrt{24}-\sqrt{54}+\sqrt{150}$

b) $3\sqrt{48}-\frac{1}{2}\sqrt{8}+2\sqrt{27}-\frac{4}{3}\sqrt{72}$

B. Multiplying Radicals

2. Simplify (ie. expand first and then simplify.)

a) $2\sqrt{2}\left(\sqrt{10}-3\sqrt{14}\right)$

b) $\left(2\sqrt{3}+\sqrt{5}\right)\left(\sqrt{3}-4\sqrt{5}\right)$

C. Dividing Radicals

3. Simplify (ie. ***rationalize*** the denominator).

a) $\frac{5}{\sqrt{6}}$

b) $\frac{\sqrt{5}}{\sqrt{40}}$

c) $\frac{3}{2\sqrt{6}-\sqrt{3}}$

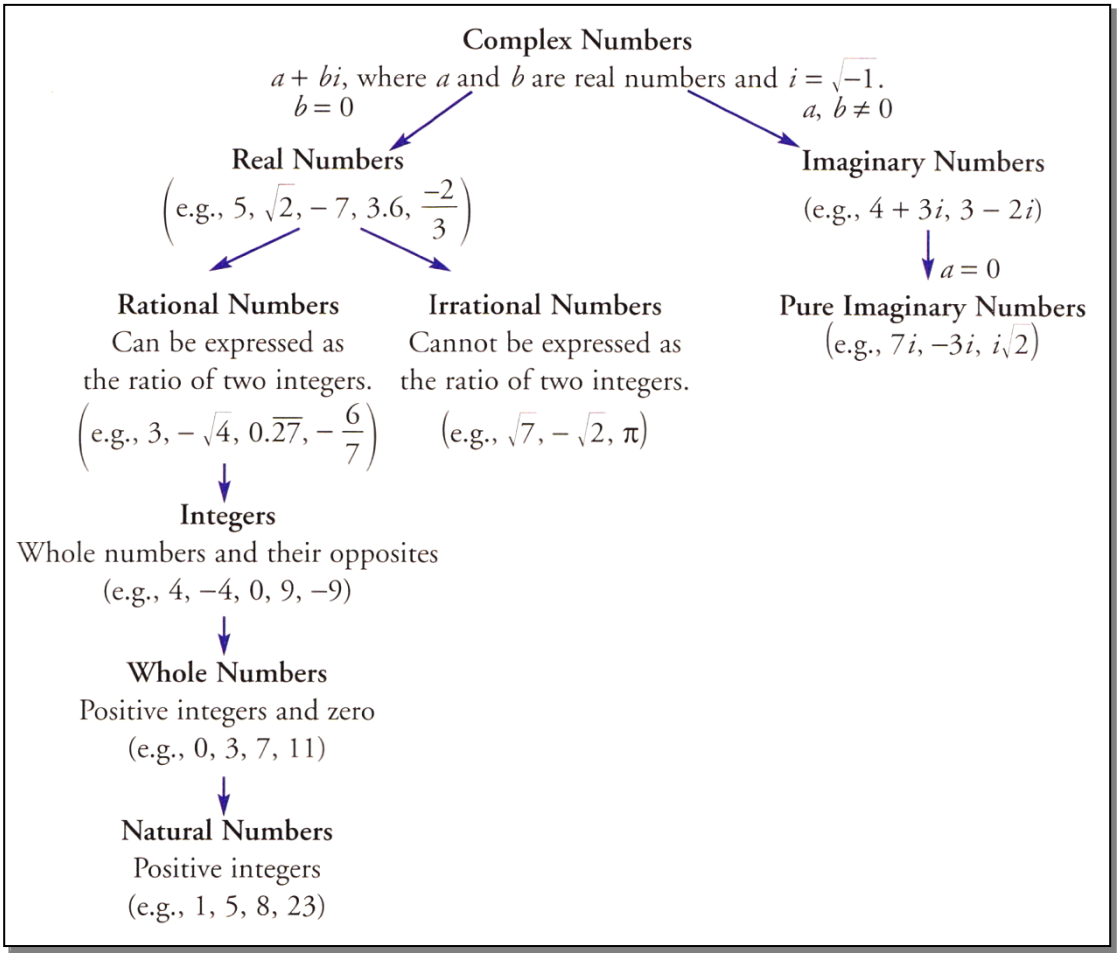
d) $\frac{2\sqrt{7}-\sqrt{3}}{2\sqrt{3}+3\sqrt{7}}$

HW. Exercise 1.9

Date:_____

1.10 Working With Complex Numbers

Definition: ***Complex Numbers, C,*** *are of the form* ***a*** *+* ***bi****, where* ***a*** *and* ***b*** *are real numbers and* ***i****, the imaginary unit is equal to* $\sqrt{-1}$*, ie.* $i = \sqrt{-1}$ *and* $i^2 = -1$.



A. Simplifying Complex Numbers

1. Simplify.

a) $\sqrt{-25}$ **b)** $\sqrt{-48}$ **c)** $\sqrt{-125}$ **d)** $-\sqrt{-4}$

e) $3-\sqrt{-28}$ **f)** $\dfrac{-21+\sqrt{-98}}{7}$ **g)** $\dfrac{-12+\sqrt{-9}}{-6}$

B. Adding and Subtracting Complex Numbers

2. Simplify.

a) $(6-4i)+(-2+3i)$ **b)** $(-4-5i)-(3-2i)$

C. Multiplying Complex Numbers

3. Simplify.

a) $3i \times 6i$ **b)** $(2i)(-5i)(3i)$ **c)** $\left(-3i\sqrt{2}\right)^2$

d) $3i(2+4i)$ **e)** $(1-4i)(3+2i)$ **f)** $(3-5i)^2$

D. Dividing Complex Numbers

4. Simplify by ***rationalizing*** the denominators.

a) $\frac{5}{2i}$ **b)** $\frac{3i}{-3+i}$ **c)** $\frac{2+3i}{1-2i}$

HW. Exercise 1.10
Unit 1 Part II Test covers Days 5 to 10
HW. Part II Review 1.5 to 1.10