HOMEWORK 6-0

1) a) $(x^{-2}y^{-3})^4 = x^{-8}y^{-12} = \frac{1}{x^8y^{12}}$

b) $(x^4)^{-3}(2x^4)$
$= x^{-12}(2x^4) = 2x^{-8}$
$= \frac{2}{x^8}$

c) $\frac{2y^3 \cdot \cancel{3}xy^3}{\cancel{3}x^2y^4} = \frac{2x^1y^6}{x^2y^4} = \frac{2y^2}{x}$

d) $\frac{x^3y^3z^2}{3x^2y^4} = \frac{xz^2}{3y}$

e) $\frac{3x^2y^2}{2x^{-1}(4x^1y^2)} = \frac{3x^2\cancel{y^2}}{8\cancel{x^0}\cancel{y^2}} = \frac{3x^2}{8}$

anything to power of 0 equals 1

f) $\frac{2x^2y^4 \cdot 4x^2y^4 \cdot \cancel{3}x}{\cancel{3}x^{-3}y^2} = \frac{8x^5y^8}{x^{-3}y^2} = 8x^8y^6$

HOMEWORK 6-1

1) a) $\sqrt{625} = \pm 25$ b) $\sqrt{\frac{16}{81}} = \pm\frac{4}{9}$

2) a) $\sqrt[3]{-216} = -6$ b) $\sqrt[3]{0.027} = 0.3$

3) a) $\sqrt[4]{-1296} =$ NOT REAL b) $\sqrt[4]{0.2401} = \pm 0.7$

even roots have positive and negative solutions

odd roots have either positive or negative solution

4) a) $\sqrt{400} = \pm 20$ b) $-\sqrt[4]{256} = -4$ or $+4$ c) $\sqrt[3]{-729} = -9$

5) a) $\sqrt{25x^6} = 5x^3$ b) $\sqrt[3]{343x^9y^{12}} = 7x^3y^4$ c) $\sqrt[4]{16x^{16}y^{20}} = 2x^4y^5$

6-1 continued

6) I should only include an absolute value when the root and the power are same even numbers

Example: $\sqrt{x^2} = |x|$ $\quad \sqrt[4]{x^4} = |x|$ $\quad \sqrt[6]{x^6} = |x|$

HOMEWORK 6-2

1) a) $\sqrt[3]{4} \cdot \sqrt[3]{6} = \sqrt[3]{24} = \sqrt[3]{8 \cdot 3} = 2\sqrt[3]{3}$

perfect cube

b) $\sqrt{5} \cdot \sqrt{8} = \sqrt{40} = \sqrt{4 \cdot 10} = 2\sqrt{10}$

c) $\sqrt[3]{6} \cdot \sqrt[3]{9} = \sqrt[3]{54} = \sqrt[3]{27 \cdot 2} = 3\sqrt[3]{2}$

2) a) $\sqrt[3]{27x^6} = 3x^2$

b) $\sqrt{48x^3y^4} = \sqrt{16 \cdot 3 \cdot x^2 \cdot x \cdot y^4}$

$= 4\sqrt{3}\,|x|\sqrt{x}\,y^2$

$= 4\,|x|\,y^2\sqrt{3x}$

c) $\sqrt[5]{128x^2y^{25}} = \sqrt[5]{2^7x^2y^{25}} = 2\sqrt[5]{4x^2}\,y^5$

$2^5 \quad 2^2$

$= 2y^5\sqrt[5]{4x^2}$

3) a) $\sqrt{12} \cdot \sqrt{3} = \sqrt{36} = 6$

b) $\sqrt[4]{7x^6} \cdot \sqrt[4]{32x^2}$

$= \sqrt[4]{224x^8} = \sqrt[4]{16 \cdot 14x^8}$

$= 2^4$

$= 2x^2\sqrt[4]{14}$

c) $2\sqrt[3]{6x^4y} \cdot 3\sqrt[3]{9x^5y^2}$

$= 6\sqrt[3]{54x^9y^3} = 6\sqrt[3]{27 \cdot 2x^9y^3} = 6 \cdot 3x^3y\sqrt[3]{2}$

$= 18x^3y\sqrt[3]{2}$

4) a) $\dfrac{\sqrt[4]{405x^8y^2}}{\sqrt[4]{5x^3y^2}} = \sqrt[4]{81\underbrace{x^5}_{x^4 \cdot x}\underbrace{\cancel{y^0}}_{=1}} = 3|x|\sqrt[4]{x}$

b) $\dfrac{\sqrt[3]{75x^7y^2}}{\sqrt[4]{25x^4}}$ cannot divide roots are different !

5) $\sqrt{5x^3} \cdot \sqrt[3]{5xy^2} \neq 5x^2y$ because we can <u>not</u> multiply radicals with different indexes

HOMEWORK 6-3

1) a) $\sqrt{18} + \sqrt{32} = \sqrt{9 \cdot 2} + \sqrt{16 \cdot 2}$

$= 3\sqrt{2} + 4\sqrt{2} = \boxed{7\sqrt{2}}$

b) $\sqrt[4]{\underbrace{324}_{\underbrace{3 \cdot 3 \cdot 3 \cdot 3 \cdot 2 \cdot 2}_{3^4 \cdot 4}}} - \sqrt[4]{\underbrace{2500}_{\underbrace{5 \cdot 5 \cdot 5 \cdot 5 \cdot 2 \cdot 2}_{5^4 \cdot 4}}} = 3\sqrt[4]{4} + 5\sqrt[4]{4}$

$\boxed{8\sqrt[4]{4}}$

c) $\sqrt[3]{\underbrace{192}_{64 \cdot 3}} + \sqrt[3]{\underbrace{24}_{8 \cdot 3}} = 4\sqrt[3]{3} + 2\sqrt[3]{3}$

$= \boxed{6\sqrt[3]{3}}$

6-3 continued

2)

a) $(3-\sqrt{6})(2-\sqrt{6})$

	3	$-\sqrt{6}$
2	6	$-2\sqrt{6}$
$-\sqrt{6}$	$-3\sqrt{6}$	6

$= \boxed{12-5\sqrt{6}}$

b) $(5+\sqrt{5})(1-\sqrt{5})$

	5	$+\sqrt{5}$
1	$\cancel{5}$	$\sqrt{5}$
$-\sqrt{5}$	$-5\sqrt{5}$	$\cancel{-5}$

$= \boxed{-4\sqrt{5}}$

c) $(7-\sqrt{2})(7+\sqrt{2})$

$= 7^2 - \sqrt{2}^2 = 49 - 2 = \boxed{47}$

difference of squares!!!

3)

a) $\dfrac{3}{2+\sqrt{6}} \cdot \boxed{\dfrac{2-\sqrt{6}}{2-\sqrt{6}}}$ whatever you do to the denominator you must do to numerator!

multiply by conjugate!

difference of squares

$= \dfrac{6-3\sqrt{6}}{4-6} = \dfrac{6-3\sqrt{6}}{-2} = -3 + \frac{3}{2}\sqrt{6}$

b) $\dfrac{7+\sqrt{5}}{6-\sqrt{5}} \cdot \boxed{\dfrac{6+\sqrt{5}}{6+\sqrt{5}}} = \dfrac{42+7\sqrt{5}+6\sqrt{5}+5}{36-5}$

$= \dfrac{47+13\sqrt{3}}{31}$ or $\dfrac{47}{31} + \dfrac{13\sqrt{3}}{31}$

4) My classmate multiplied numerator and denominator by the same number, he/she should had multiplied by the conjugate of $1-\sqrt{2}$ which is $1+\sqrt{2}$

$\dfrac{1}{1-\sqrt{2}} \cdot \dfrac{1+\sqrt{2}}{1+\sqrt{2}} = \dfrac{1+\sqrt{2}}{1^2-\sqrt{2}^2} = \dfrac{1+\sqrt{2}}{1-2} = \dfrac{1+\sqrt{2}}{-1} = \boxed{-1-\sqrt{2}}$

diff. of squares

HOMEWORK 6-4

1) a) $16^{\frac{1}{4}} = \sqrt[4]{16} = \boxed{2}$ ($2 \cdot 2 \cdot 2 \cdot 2$)

b) $(-3)^{\frac{1}{3}}(-3)^{\frac{1}{3}}(-3)^{\frac{1}{3}} = (-3)^1 = \boxed{-3}$

$\underline{\underline{or}}$ $\sqrt[3]{-3} \cdot \sqrt[3]{-3} \cdot \sqrt[3]{-3} = \boxed{-3}$

c) $5^{\frac{1}{2}} \cdot 45^{\frac{1}{2}} = (5 \cdot 45)^{\frac{1}{2}} = (5 \cdot 5 \cdot 3 \cdot 3)^{\frac{1}{2}} = 5 \cdot 3 = \boxed{15}$ ($45 = 5 \cdot 9$)

square root

2) write in radical form

a) $x^{\frac{1}{4}} = \sqrt[4]{x}$ b) $x^{\frac{4}{5}} = \sqrt[5]{x^4}$ c) $x^{\frac{2}{9}} = \sqrt[9]{x^2}$

3) write in exponential form

a) $\sqrt[3]{2} = 2^{\frac{1}{3}}$ b) $\sqrt[3]{2x^2} = (2x^2)^{\frac{1}{3}}$ $\underline{\underline{or}}$ $2^{\frac{1}{3}} x^{\frac{2}{3}}$

c) $\sqrt[3]{(2x)^2} = (2x)^{\frac{2}{3}}$ or $2^{\frac{2}{3}} x^{\frac{2}{3}}$

4) simplify

a) $(-216)^{1/3} = \sqrt[3]{-216} = -6$ b) $\sqrt[4]{6} \cdot \sqrt[3]{6} = 6^{\frac{1}{4}} \cdot 6^{\frac{1}{3}}$

$= 6^{\frac{3}{12} + \frac{4}{12}} = 6^{\frac{7}{12}}$

$= \sqrt[12]{6^7}$

c) $32^{-0.4} = \dfrac{1}{32^{0.4}} = \dfrac{1}{32^{\frac{2}{5}}} = \dfrac{1}{2^2} = \dfrac{1}{4}$

5th root of 32 is 2

5) $N = \dfrac{a^{0.5}}{2\pi r^{0.5}} = \dfrac{a^{\frac{1}{2}}}{2\pi r^{\frac{1}{2}}} = \dfrac{\sqrt{a}}{2\pi\sqrt{r}}$ $a = 9.8$, $r = 1.7$ $N = \dfrac{\sqrt{9.8}}{2\pi\sqrt{1.7}}$

$\approx 0.38 \dfrac{\text{revolutions}}{\text{second}}$

HOMEWORK 6-5

1) a) $\sqrt{x+2} - \cancel{2} = 0$ isolate the radical

$\quad\quad\cancel{+2} \quad +2$

$\cancel{\sqrt{x+2}^{2}} = 2^2$ square both sides to cancel the root

$x + \cancel{2} = 4$

$\quad \cancel{-2} \quad -2$

$\boxed{x = 2}$

b) $\sqrt{2x+3} - \cancel{7} = 0$

$\quad\quad \cancel{+7} \quad +7$

$\sqrt{2x+3}^{2} = 7^2$

$2x + \cancel{3} = 49$

$\quad \cancel{-3} \quad -3$

$\frac{\cancel{2}x}{\cancel{2}} = \frac{46}{2}$

$\boxed{x = 23}$

c) $\cancel{2} + \sqrt{3x-2} = 6$

$\cancel{-2} \quad\quad -2$

$\sqrt{3x-2}^{2} = 4^2$

$3x - \cancel{2} = 16$

$\quad \cancel{+2} \quad +2$

$\frac{\cancel{3}x}{\cancel{3}} = \frac{18}{3}$

$\boxed{x = 6}$

2) a) $\frac{\cancel{2}}{\cancel{2}}(x-2)^{\frac{2}{5}} = \frac{50}{2}$ isolate parenthesis

$(x-2)^{\frac{2}{5}\cdot\frac{5}{2}} = 25^{\frac{5}{2}}$ raise both sides to reciprocal powers

$(x-2) = 5^5$

$x - \cancel{2} = 3125$

$\quad \cancel{+2} \quad +2$

$\boxed{x = 3127}$

6-5 cont.

x is at more than one place, which means check solutions!

2) b) $(6x-5)^{\frac{1}{3}} + \cancel{3} = -2$

$\quad\quad\cancel{-3} \quad -3$

$(6x-5)^{\frac{1}{3}\cdot 3} = (-5)^3$

$6x - \cancel{5} = -125$

$\quad \cancel{+5} \quad +5$

$\dfrac{\cancel{6}x}{\cancel{6}} = \dfrac{-120}{6}$

$\boxed{x=-20}$

3) a) $\sqrt{4x+5}^{\,2} = (x+2)^2$

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

$a^2+2ab+b^2$

$\cancel{4x}+5 = x^2+\cancel{4x}+4$

$\quad -4 \quad\quad -4$

$1 = x^2$ square root

$\boxed{x = \pm 1}$

check: $x=1$ $\sqrt{4\cdot 1+5} = 1+2$

$\sqrt{9} = 3$ ✓ both solutions WORK!

$x=-1$ $\sqrt{4\cdot(-1)+5} = -1+2$

$\sqrt{1} = 1$ ✓

3) b) $\sqrt{-3x-5} - \cancel{3} = x$ isolate radical

$\quad \cancel{+3} \quad +3$

$\sqrt{-3x-5}^{\,2} = (x+3)^2$ square both sides

$a^2+2ab+b^2$

$-3\cancel{x}-\cancel{5} = x^2+6x+9$

$+\cancel{3}x \cancel{+5} \quad +3x \quad +5$

$0 = x^2+9x+14$

$0 = (x+7)(x+2)$

$\boxed{x=-7,\ x=-2}$

instead of factoring, if calculator is allowed use MENU 5 → Graph then find ROOTS!

4) $V=28$ $V=\pi r^2 h$

$h=4$ $\dfrac{28}{4} = \dfrac{\pi r^2}{4}$

$\dfrac{7}{\pi} = \dfrac{\pi r^2}{\pi}$

$r^2 = \dfrac{7}{\pi}$

$r = \sqrt{\dfrac{7}{\pi}}$ or $-\sqrt{\dfrac{7}{\pi}}$

$= \boxed{1.49}$ $\quad$ ~~$= -1.49$~~

radius cannot be negative!

5) No because power of $\frac{3}{4}$ means power of 3 and 4^{th} root. Even roots have to have positive RADICANDS.

6) $\sqrt{x+2}^{\,2} = x^2$

$\cancel{x}+\cancel{2} = x^2$
$-\cancel{x}\ -\cancel{2} \qquad -x\ -2$

$0 = x^2 - x - 2$ ← factor or use MENU 5 → roots!

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

$x = 2 \qquad x = -1$

$\underline{\text{check}}$ $x=2$ $\qquad \sqrt{2+2} = 2$
$\qquad \sqrt{4} = 2$ ✓

$\underline{\text{check}}$ $x=-1$ $\qquad \sqrt{-1+2} = -1$
$\qquad \sqrt{1} = -1$ ← $\sqrt{1} = 1$ when solving equations all roots are principal roots

$x = -1$ is an extraneous solution because it produces an incorrect equation.

REMINDER: you can check all Real solutions of any equation by setting up Left side of the equation to be y1: and right side to be y2: (calculator MENU 5), then find intersect