Questions from Last Week

1) $\sqrt[3]{\dfrac{x^2}{y^6}} = \dfrac{\sqrt[3]{x^2}}{\sqrt[3]{y^6}} = \dfrac{\sqrt[3]{x^2}}{y^2}$

$\sqrt[3]{y^6} \to y^{6/3}$

6) $\dfrac{\sqrt{5x^4}}{\sqrt{5x^3}} = \sqrt{\dfrac{\cancel{5}\cancel{x^4}^{1}}{\cancel{5}\cancel{x^3}}} = \sqrt{x}$

5) $\dfrac{\sqrt[5]{a^2}}{\sqrt[5]{b^2}} \cdot \dfrac{\sqrt[5]{b^3}}{\sqrt[5]{b^3}} = \dfrac{\sqrt[5]{a^2}\,\sqrt[5]{b^3}}{\sqrt[5]{b^5}} = \dfrac{\sqrt[5]{a^2b^3}}{b}$

7) $\dfrac{\sqrt[5]{a^2}}{\sqrt[5]{b^3}} \cdot \dfrac{\sqrt[5]{b^2}}{\sqrt[5]{b^2}} = \dfrac{\sqrt[5]{a^2b^2}}{\sqrt[5]{b^5}} = \dfrac{\sqrt[5]{a^2b^2}}{b}$

41) $\sqrt{\frac{3}{2}} = \frac{\sqrt{3}\sqrt{2}}{\sqrt{2}\sqrt{2}} = \frac{\sqrt{6}}{\sqrt{4}} = \frac{\sqrt{6}}{2}$

19) $\sqrt[4]{\dfrac{32a^4}{2b^4c^8}} = \sqrt[4]{\dfrac{16a^4}{b^4c^8}} = \dfrac{2a}{bc^2}$

16
4 4
2 2 2 2

$$\frac{a^{4/4}}{b^{4/4}c^{8/4}}$$

pg 738

6) $\sqrt[4]{10-x}$

$10-x \geq 0$

$\frac{-x}{-1} \geq \frac{-10}{-1}$

$x \leq 10$

$\sqrt[3]{x^2}\,\sqrt[4]{x^3} = \sqrt[12]{x^{17}}$

$x^{2/3}\,x^{3/4} = x^{17/12}$

39) $\dfrac{\sqrt[3]{x^3-y^3}}{\sqrt[3]{x-y}} = \sqrt[3]{\dfrac{\cancel{(x-y)}(x^2+xy+y^2)}{\cancel{(x-y)}}}$

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

New Work
Sections
10-5
10-6
10-8

1) $2\sqrt{5} + 7\sqrt{5}$ $\qquad$ $2x + 7x$

$(2+7)\sqrt{5}$ $\qquad$ $9x$

$9\sqrt{5}$

2) $9\sqrt[3]{7} - \sqrt{3} + 4\sqrt[3]{7} + 2\sqrt{3}$

$13\sqrt[3]{7} + \sqrt{3}$

3) $\sqrt{2} + 3x\sqrt{2} - 5\sqrt{2}$

$(1 + 3x - 5)\sqrt{2}$

$(3x - 4)\sqrt{2}$

4) $9\sqrt{50} - 4\sqrt{2}$

$25 \quad 2$

$5 \quad 5$

$9 \cdot 5$

$45\sqrt{2} - 4\sqrt{2} = 41\sqrt{2}$

5) $5\sqrt{12} + 6\sqrt{27}$

$4 \quad 3 \qquad\qquad 9 \quad 3$

$2 \; 2 \qquad\qquad 3 \; 3$

$5 \cdot 2\sqrt{3} \qquad 6 \cdot 3\sqrt{3}$

$10\sqrt{3} + 18\sqrt{3}$

$28\sqrt{3}$

6) $\sqrt[3]{2x^6y^4} + 7\sqrt[3]{2y}$

$xxx \; yyy$
xxx
y

$x^2y\sqrt[3]{2y} + 7\sqrt[3]{2y}$

$(x^2y+7)\sqrt[3]{2y}$

Lets Multiply

1) $\sqrt{3}\left(4+\sqrt{3}\right)$

$4\sqrt{3}+\sqrt{9}$

$4\sqrt{3}+3$

2) $\sqrt{2}\left(3\sqrt{10}-2\sqrt{2}\right)=6\sqrt{5}-4$

$3\sqrt{20}-2\sqrt{4}$

$20 \to 4 \cdot 5$, $4 \to 2 \cdot 2$

$4 \to 2 \cdot 2$

$3\cdot 2\sqrt{5}-2\cdot 2$

3) $\sqrt[3]{x}\left(\sqrt[3]{3x^2} - \sqrt[3]{81x^2}\right)$

81

$9 \quad 9$

$3 \; 3 \; 3 \; 3$

$\sqrt[3]{3x^2} - 3\sqrt[3]{3x^2}$

$\sqrt[3]{x}\left(-2\sqrt[3]{3x^2}\right)$

$-2\sqrt[3]{3x^3}$

$-2x\sqrt[3]{3}$

$\sqrt[3]{3x^3} - \sqrt[3]{81x^3}$

$\downarrow$

$x\sqrt[3]{3} - 3x\sqrt[3]{3}$

$-2x\sqrt[3]{3}$

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

$4\sqrt{9}-20\sqrt{6}+\sqrt{6}-5\sqrt{4}$

$4\cdot3 \qquad\qquad 5\cdot2$

$12 \qquad\qquad -10$

$2-19\sqrt{6}$

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

8.5
40

$8\sqrt{25} + 16\sqrt{10} - 6\sqrt{10} - 12\sqrt{4}$ ← $12 \cdot 2$
-24

$16 + 10\sqrt{10}$

Conjugate Pairs

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

$\sqrt{9} \cancel{- 2\sqrt{3}} \cancel{+ 2\sqrt{3}} - 4$

$3 \qquad -4$

-1

Division Oh My

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

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

$3-x^2$

2) $$\frac{3\sqrt{2}-\sqrt{7}}{4\sqrt{2}+2\sqrt{5}} \cdot \frac{(4\sqrt{2}-2\sqrt{5})}{(4\sqrt{2}-2\sqrt{5})} =$$

$$\frac{\overset{24}{12\sqrt{4}}-6\sqrt{10}-4\sqrt{14}+2\sqrt{35}}{\underset{32}{16\sqrt{4}}-8\sqrt{10}+8\sqrt{10}-\underset{-20}{4\sqrt{25}}}$$

$$\frac{24-6\sqrt{10}-4\sqrt{14}+2\sqrt{35}}{12}$$

$$2-\tfrac{1}{2}\sqrt{10}-\tfrac{1}{3}\sqrt{14}+\tfrac{1}{6}\sqrt{35}$$

Complex Numbers → Not as complex as you think

$$\sqrt{-1} = i$$

$$\sqrt{-25} = \sqrt{25} \cdot \sqrt{-1} = 5i$$

$$\sqrt{-7} = i\sqrt{7}$$

Complex #'s $a + bi$

Real #'s

$3 \to 3 + 0i$

$5i \to 0 + 5i$

$3 + 4i$

$\frac{5+2i}{3} \to \frac{5}{3} + \frac{2}{3}i$

1) Add $(8+6i)+(3+2i) = 11+8i$

$$-6 \quad +3i$$

2) $(4+5i)-(6-3i) = -2+8i$

$$\sqrt{-2}\cdot\sqrt{-5} =$$

$$i\sqrt{2}\cdot i\sqrt{5} = i^2\sqrt{10} = -\sqrt{10}$$

$i = \sqrt{-1} = i$

$i^2 = \left(\sqrt{-1}\right)^2 = -1$

$i^3 = i^2\cdot i = -1\cdot i = -i$

$i^4 = i^2\cdot i^2 = (-1)(-1) = 1$

$i^5 = i^4\cdot i = i$

$i^6 = i^4\cdot i^2 = -1$

$i^7 = i^4\cdot i^3 = -i$

$i^8 = i^4\cdot i^4 = 1$

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

$i^{65} = i^{64+1} = i$

$i^{170} = -1$

$i^{7482} = -1$

$-4i(3-5i)$ $\quad -20-12i$

$-12i+20i^2$

-20

$(1+2i)(4+3i) = -2+11i$

$4+3i+8i+6i^2 \leftarrow -6$

$$\frac{-5+9i}{(1-2i)}\frac{(1+2i)}{(1+2i)} = \frac{-23-i}{5}$$

$$\frac{-5-10i+9i+18i^2}{1+2i-2i-4i^2}$$

$i^2 \leftarrow -18$

$+4$

$$\frac{-23-i}{5} = -\frac{23}{5} - \frac{1}{5}i$$

Solving Radical Equations

$$\sqrt{x} - 3 = 4$$
$$\quad +3 \quad\; +3$$

$$(\sqrt{x})^2 = (7)^2$$

$$x = 49$$

$$\sqrt{49} - 3 = 4$$
$$7 - 3 = 4$$
$$4 = 4 \checkmark$$

$$\sqrt{x} + 5 = 3$$

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

$$x = 4$$

$$\sqrt{4} + 5 = 3$$

$$2 + 5 = 3$$

$$7 = 3 \text{ X}$$

No Solution

$$x = \sqrt{x+7} + 5 \qquad x = 9$$

$$(x-5)^2 = \left(\sqrt{x+7}\right)^2$$

$$x^2 - 10x + 25 = x + 7$$

$$x^2 - 11x + 18 = 0$$

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

$$x - 2 = 0 \qquad x - 9 = 0$$

$x = 2$ or $x = 9$

$x = 2$

$2 = 8$ ✗

$x = 9$

$9 = 9$ ✓

$$9 = \sqrt{9+7} + 5$$

$$9 = \sqrt{16} + 5$$

$$9 = 4 + 5$$

$9 = 9$ ✓

$$(2x+1)^{1/3}+5=0$$

$$\sqrt[3]{2x+1}+5=0$$

$$\left(\sqrt[3]{2x+1}\right)^3=(-5)^3$$

$$2x+1=-125$$

$$\frac{2x}{2}=\frac{-126}{2}$$

$$x=-63$$

$$\sqrt[3]{2(-63)+1}+5=0$$

$$\sqrt[3]{-126+1}+5=0$$

$$\sqrt[3]{-125}+5=0$$

$$-5+5=0$$

$$0=0\ \checkmark$$

$$\left(\sqrt{2x-5}\right)^2 = \left(1+\sqrt{x-3}\right)^2$$

$$2x-5 = 1+\sqrt{x-3}+\sqrt{x-3}+\left(\sqrt{x-3}\right)^2$$

$$\left(\sqrt{x-3}\right)^2 \to x-3$$

$$2x-5 = -2+x+2\sqrt{x-3}$$

$$\begin{array}{ll} -x+2 & +2\ -x \end{array}$$

$$(x-3)^2 = \left(2\sqrt{x-3}\right)^2$$

$$x^2-6x+9 = 4(x-3) \leftarrow 4x-12$$

$$x^2-10x+21=0$$

$$(x-7)(x-3)=0$$

$x=7$

$x=3$

$$(1+\sqrt{x-3})(1+\sqrt{x-3})$$

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

$$1+2\sqrt{x-3}+x-3$$