Radical Review

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9:43 AM

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PRE-CALCULUS 11
RADICALS
REVIEW

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A. <u>Things to Know</u>

1. Simplifying Radicals
2. Adding & Subtracting Radicals
3. Multiplying & Dividing Radicals
4. Solving Radical Equations

B. <u>Examples</u>

1. Simplify the following radicals.

a) $\sqrt{125}$

$\sqrt{25} \cdot \sqrt{5}$

$\boxed{5\sqrt{5}}$

b) $\sqrt[4]{96}$

$\sqrt[4]{16} \cdot \sqrt[4]{6}$

$\boxed{2\sqrt[4]{6}}$

c) $\sqrt{18m^5}$　$\boxed{m \geq 0}$

$\sqrt{9} \cdot \sqrt{m^4} \cdot \sqrt{2m}$

$\boxed{3m^2\sqrt{2m}}$

d) $\sqrt[3]{-16x^6}$　$\boxed{x \in R.}$

$\sqrt[3]{-8} \cdot \sqrt[3]{x^6} \cdot \sqrt[3]{2}$

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

2. Simplify the following.

a) $3\sqrt{12} - \sqrt{12} + 2\sqrt{12}$

$4\sqrt{12}$

$4\sqrt{4} \cdot \sqrt{3}$

$\boxed{8\sqrt{3}}$

b) $\sqrt{81} + \sqrt{50} - \sqrt{121} + \sqrt{98}$

$\sqrt{25} \cdot \sqrt{2} \qquad \sqrt{49} \cdot \sqrt{2}$

$9 + 5\sqrt{2} - 11 + 7\sqrt{2}$

$\boxed{-2 + 12\sqrt{2}}$

c) $\sqrt[3]{24} - \sqrt[3]{81}$

$\sqrt[3]{8} \cdot \sqrt[3]{3} - \sqrt[3]{27} \cdot \sqrt[3]{3}$

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

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

d) $2\sqrt{45x^3} - \sqrt{27x} + 6\sqrt{3x} - \sqrt{125x^3}$　$\boxed{x \geq 0}$

$2\sqrt{9} \cdot \sqrt{x^2} \cdot \sqrt{5x} - \sqrt{9} \cdot \sqrt{3x} \qquad -\sqrt{25} \cdot \sqrt{x^2} \cdot \sqrt{5x}.$

$6x\sqrt{5x} - 3\sqrt{3x} + 6\sqrt{3x} - 5x\sqrt{5x}$

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

3. Simplify the following.

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

$= -6\sqrt{12}$

$-6\sqrt{4}\cdot\sqrt{3}$

$= \boxed{-12\sqrt{3}}$

b) $\sqrt[3]{16}\left(\sqrt[3]{4}+\sqrt[3]{2}\right)$

$\sqrt[3]{64} + \sqrt[3]{32}$
$\quad\quad\quad \sqrt[3]{8}\cdot\sqrt[3]{4}$

$\boxed{4 + 2\sqrt[3]{4}}$

c) $\left(\sqrt{2}-\sqrt{5}\right)\left(\sqrt{2}+\sqrt{5}\right)$

$\sqrt{4} \; +\sqrt{10} \; -\sqrt{10} \; -\sqrt{25}$

$2 - 5$

$= \boxed{-3}$

d) $\left(3\sqrt{3}-\sqrt{8}\right)^2$

$\left(3\sqrt{3}-\sqrt{8}\right)\left(3\sqrt{3}-\sqrt{8}\right)$

$9\sqrt{9} \; -3\sqrt{24} \; -3\sqrt{24} \; +\sqrt{64}$
$\quad\quad -3\sqrt{4}\cdot\sqrt{6} \quad -3\sqrt{4}\cdot\sqrt{6}$

$27 \; -6\sqrt{6} \; -6\sqrt{6} \; +8$

$= \boxed{35 - 12\sqrt{6}}$

4. Rationalize the denominator.

a) $\dfrac{\sqrt{2}}{\sqrt{3}} \begin{smallmatrix}\times\sqrt{3}\\[2pt]\times\sqrt{3}\end{smallmatrix}$

$= \dfrac{\sqrt{6}}{\sqrt{9}}$

$= \boxed{\dfrac{\sqrt{6}}{3}}$

b) $\dfrac{8\sqrt{18}}{6\sqrt{54}}$ $\quad \dfrac{4\sqrt{18}}{3\sqrt{54}} \quad \dfrac{4\sqrt{9}\cdot\sqrt{2}}{3\sqrt{9}\cdot\sqrt{6}}$

$\dfrac{12\sqrt{2}}{9\sqrt{6}} \begin{smallmatrix}\times\sqrt{6}\\[2pt]\times\sqrt{6}\end{smallmatrix}$

$\dfrac{12\sqrt{12}}{9\sqrt{36}} \quad \dfrac{12\sqrt{4}\cdot\sqrt{3}}{}$

$\dfrac{24\sqrt{3}}{54} \begin{smallmatrix}\div6\\[2pt]\div6\end{smallmatrix}$

$\boxed{\dfrac{4\sqrt{3}}{9}}$

c) $\dfrac{\overset{\sqrt{2}}{(3\sqrt{2}-2\sqrt{6})}}{2\sqrt{2}} \times \sqrt{2}$

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

$\dfrac{3\sqrt{4}-2\sqrt{12}}{2\sqrt{4}}$

$\dfrac{\overset{\div 2}{\cancel{6}}\,\overset{\div 2}{(-4)}\sqrt{3}}{\underset{\div 2}{\cancel{4}}}$

$$\boxed{\dfrac{3-2\sqrt{3}}{2}}$$

d) $\dfrac{(\sqrt{8}+\sqrt{6})(\sqrt{6}+\sqrt{2})}{(\sqrt{6}-\sqrt{2})(\sqrt{6}+\sqrt{2})}$

$\overset{\sqrt{16}\cdot\sqrt{3}}{}\qquad\qquad\overset{\sqrt{4}\cdot\sqrt{3}}{}$

$\dfrac{\sqrt{48}+\sqrt{16}+\sqrt{36}+\sqrt{12}}{\sqrt{36}\;\cancel{+\sqrt{12}}\;\cancel{-\sqrt{12}}\;-\sqrt{4}}$

$\dfrac{\underline{4\sqrt{3}}+\underline{4}+\underline{6}\;\cancel{-2\sqrt{3}}}{6-2}$

$\dfrac{\overset{\div 2}{\cancel{10}}+\overset{\div 2}{\cancel{6}}\sqrt{3}}{\underset{\div 2}{\cancel{4}}}$

$$\boxed{\dfrac{5+3\sqrt{3}}{2}}$$

5. Solve the following radical equations.

a) $2\sqrt{2x+4}+12=4$

$\phantom{2\sqrt{2x+4}}\;\underset{-12}{\cancel{}}\;\underset{-12}{}$

$\dfrac{\cancel{2}\sqrt{2x+4}}{}=\dfrac{-8}{2}$

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

$2x+\cancel{4}=16$

$\;\underset{-4}{}=\underset{-4}{}$

$\dfrac{\cancel{2}x}{}=\dfrac{12}{2}$

$\cancel{X=6.}$ $\boxed{No\ Solution}$

check.

$2\sqrt{2x+4}+12=4$

$2\sqrt{2(6)+4}+12=4$

$2\sqrt{16}+12$

$8+12$

$20=4$

Extraneous Root

e) $\left(\sqrt{-3x+7}\right)^2=\left(\sqrt{-2x+9}\right)^2$

$-3x+\cancel{7}=-2x+9$

$\underset{+2x}{}\;\underset{-7}{}\qquad\underset{+2x}{}\;\underset{-7}{}$

$\dfrac{\cancel{-1}x}{-1}=\dfrac{2}{-1}$

$\boxed{X=-2}$

check.

$\sqrt{-3x+7}=\sqrt{-2x+9}$

$\sqrt{-3(-2)+7}=\sqrt{-2(-2)+9}$

$\sqrt{13}=\sqrt{13}\ \checkmark$

Assignment: Pg. 156 #2 – 13 (Omit #4b & 4d)