## 1.1 Radical Expressions: Rationalizing Denominators - Handout

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| **A Radicals**<br>$\sqrt{a}\sqrt{a}=a$<br>$(\sqrt[n]{a})^n=a$<br>$(\sqrt[n]{a^m})=a^{\frac{m}{n}}=(\sqrt[n]{a})^m$<br>Note: If $n$ is even, then $a\ge 0$ for $\sqrt[n]{a}$ . | Ex 1. Simplify:<br>a) $\sqrt{3}\sqrt{3}$<br>b) $(\sqrt{5})^3$<br>c) $(\sqrt[3]{7})^5$ |
| **B Rationalizing Denominators (I)**<br>$\frac{a}{b\sqrt{c}}=\frac{a}{b\sqrt{c}}\frac{\sqrt{c}}{\sqrt{c}}=\frac{a\sqrt{c}}{bc}$ | Ex 2. Rationalize:<br>$\frac{2}{3\sqrt{5}}$ |
| **C Conjugate Radicals**<br>$a+\sqrt{b}\Leftrightarrow a-\sqrt{b}$<br>$\sqrt{a}+\sqrt{b}\Leftrightarrow\sqrt{a}-\sqrt{b}$<br>$\sqrt{a}+b\sqrt{c}\Leftrightarrow\sqrt{a}-b\sqrt{c}$<br>$a\sqrt{b}+c\sqrt{d}\Leftrightarrow a\sqrt{b}-c\sqrt{d}$ | Ex 3. For each expression, find the conjugate radical.<br>a) $2+\sqrt{3}\quad\Rightarrow$<br>b) $\sqrt{2}-\sqrt{3}\quad\Rightarrow$<br>c) $\sqrt{3}+2\sqrt{5}\quad\Rightarrow$<br>d) $2\sqrt{5}+3\sqrt{7}\quad\Rightarrow$ |
| **D Difference of squares identity**<br>$(a+b)(a-b)=a^2-b^2$ | Ex 4. Use the difference of squares identity to simplify:<br>a) $(a+\sqrt{b})(a-\sqrt{b})$<br>b) $(\sqrt{a}+\sqrt{b})(\sqrt{a}-\sqrt{b})$<br>c) $(\sqrt{a}+b\sqrt{c})(\sqrt{a}-b\sqrt{c})$ |
| **E Rationalizing Denominators (II)**<br>Hint: Multiply and divide by the *conjugate radical* of the denominator. | Ex 5. Rationalize the denominator:<br>a) $\frac{3}{1-\sqrt{2}}$<br>b) $\frac{4}{2+3\sqrt{5}}$<br>c) $\frac{2}{\sqrt{3}-\sqrt{6}}$ |
| **F Rationalizing Numerators**<br>Hint: Multiply and divide by the *conjugate radical* of the numerator. | Ex 6. Rationalize the numerator:<br>$\frac{\sqrt{5}-\sqrt{3}}{\sqrt{2}-1}$ |
| **G Equivalent Expressions**<br>Hint: You may get equivalent expressions by *rationalizing* the numerator or denominator.<br>Note: State restrictions. | Ex 7. Find equivalent expressions by rationalizing. State restrictions.<br>a) $\frac{x-1}{\sqrt{x}-1}$<br>b) $\frac{\sqrt{x+9}-3}{x}$ |


 

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| | c) $\dfrac{\dfrac{1}{\sqrt{x+h}}-\dfrac{1}{\sqrt{x}}}{h}$ |
| **H More algebraic identities**<br>$a^3-b^3=(a-b)(a^2+ab+b^2)$<br>$a^3+b^3=(a+b)(a^2-ab+b^2)$<br>$a^4-b^4=(a-b)(a+b)(a^2+b^2)$ | Ex 8. For each case, the numerator and denominator have a common zero. Use algebraic identities to eliminate the common zero. State restrictions.<br>a) $\dfrac{x-1}{\sqrt[3]{x}-1}$<br>b) $\dfrac{x^4-1}{x^3-1}$ |

**Reading**: Nelson Textbook, Pages 6-8
**Homework**: Nelson Textbook: Page 9, #1a, 2a, 3a, 4a, 5, 6a, 7ac


 