# MTH 28 LECTURE NOTES (Ojakian)

## Topic 16: Radical Arithmetic

**OUTLINE**
References: 8.4, 8.5

1. <u>Rules</u>

   (a) Radicals

      i. $\sqrt[n]{A \cdot B} = \sqrt[n]{A} \cdot \sqrt[n]{B}$

      ii. $\sqrt[n]{\dfrac{A}{B}} = \dfrac{\sqrt[n]{A}}{\sqrt[n]{B}}$

      iii. $\sqrt[n]{A^n} = A$ (for $A \geq 0$)

   (b) Exponents

      i. $A^n \cdot A^m = A^{n+m}$

      ii. $\dfrac{A^n}{A^m} = A^{n-m}$

      iii. $(A \cdot B)^n = A^n B^n$

      iv. $\left(\dfrac{A}{B}\right)^n = \dfrac{A^n}{B^n}$

      v. For $A \geq 0$: $(A^n)^m = A^{nm}$

2. <u>Simplification Requirements</u>

   (a) *No exponents are negative.*

      Example: $x^3 y^{-4}$ should be simplified to $\dfrac{x^3}{y^4}$

   (b) *Nothing can be pulled out of a radical.*
      Example: $\sqrt[3]{16}$ should be simplified to $2\sqrt[3]{2}$.

   (c) *All the exponent rules (from the key rules above) should be carried out.*
      Example: $x^3 x^5$ simplifies to $x^8$.

   (d) *Exponents on numbers should be evaluated, left as a simplified radical if need be.*
      Example: $25^{1/2}$ should be simplified to 5.
      Example: $8^{1/2}$ should be simplified to $2\sqrt{2}$.

   (e) *There are no radical symbols in the denominator.*

      Example: $\dfrac{1}{\sqrt{5}}$ should be simplified to $\dfrac{\sqrt{5}}{5}$

3. Division - Radical Expressions

**PROBLEM 1.** *Simplify the following:*

(a) $\dfrac{3}{\sqrt{6}}$

(b) $\sqrt{\dfrac{18m^5 n^6}{p^{12} q^4}}$

(c) $\sqrt{\dfrac{4}{49AC^2}}$

(d) $\dfrac{10mn}{\sqrt{5mn}}$

4. Add/Subtract - Radical Expressions

**PROBLEM 2.** *Simplify the following.*

(a) $\sqrt{2} + 3\sqrt{2}$

(b) $\sqrt[3]{4} - 5\sqrt[3]{4}$

(c) $\sqrt{75} + \sqrt{48} - 7\sqrt{12}$

(d) $\sqrt{20} + \sqrt[3]{54} - 2\sqrt{45} + \sqrt{7} + 10\sqrt[3]{16} - 4\sqrt[3]{3000}$

(e) $3\sqrt{8}(2\sqrt{10} - \sqrt{27})$

(f) $(\sqrt{5})^2 + (\sqrt{3})^2$

(g) $(\sqrt{5} + \sqrt{3})^2$