
Pictures/chapter_{head}2.pdf

1. Algebraic Expressions

1.1 Expressions

Essential Questions 1.1

1. What is an algebraic expression?

1.2 Polynomial Expressions

	Arithmetic	Polynomial	Algebraic
Constant	Yes	Yes	Yes
Factorial	Yes	Yes	Yes
Variable: parameter/coefficient	Yes	Yes	Yes
Variable: unknown/indeterminate	No	Yes	Yes
Power with \mathbb{Z}^+ exponent	No	Yes	Yes
Power with \mathbb{Z} exponent	No	No	Yes
n -th root	No	No	Yes
Power with \mathbb{Q} exponent	No	No	Yes

Table 1.1: Names of different types of expressions

Definition 1.2.1 – Operation of Exponentiation (OOE).

$$\underbrace{\underbrace{b}_{\text{base}}^{\text{Exponent } m}}_{\text{Power}} \quad (1.1)$$

Powers

Rule 1.2.1 – Power of a Quotient of Powers (PoQPo).

$$\left(\frac{a^m}{b^n}\right)^k = \frac{a^{m \cdot k}}{b^{n \cdot k}} \quad (1.2a)$$

$$\frac{a^{m \cdot k}}{b^{n \cdot k}} = \left(\frac{a^m}{b^n}\right)^k \quad (1.2b)$$

Rule 1.2.2 – Power of a Product of Powers (PoPrPo).

$$(a^m \cdot b^n)^k = a^{m \cdot k} \cdot b^{n \cdot k} \quad (1.3a)$$

$$a^{m \cdot k} \cdot b^{n \cdot k} = (a^m \cdot b^n)^k \quad (1.3b)$$

Definition 1.2.2 – Power To Factor (PoTF).

$$a^n = a_1 \cdot a_2 \cdot \dots \cdot a_{n-1} \cdot a_n \quad (1.4)$$

Definition 1.2.3 – Factor To Power (FTPo).

$$a_1 \cdot a_2 \cdot \dots \cdot a_{n-1} \cdot a_n = a^n \quad (1.5)$$

Definition 1.2.4 – Power Inverse (Pol).

$$(b^m)^{\frac{1}{m}} = b \quad (1.6a)$$

Definition 1.2.5 – Power Inverse (Pold).

$$1 = b^0 \quad (1.7a)$$

$$b^0 = 1 \quad (1.7b)$$

Notation 1.1 (Radical To Power (RTPo)).

$$\sqrt[m]{b^n} = b^{\frac{n}{m}} \quad (1.8)$$

Notation 1.2 (Power To Radical (PoTR)).

$$b^{\frac{n}{m}} = \sqrt[m]{b^n} \quad (1.9)$$

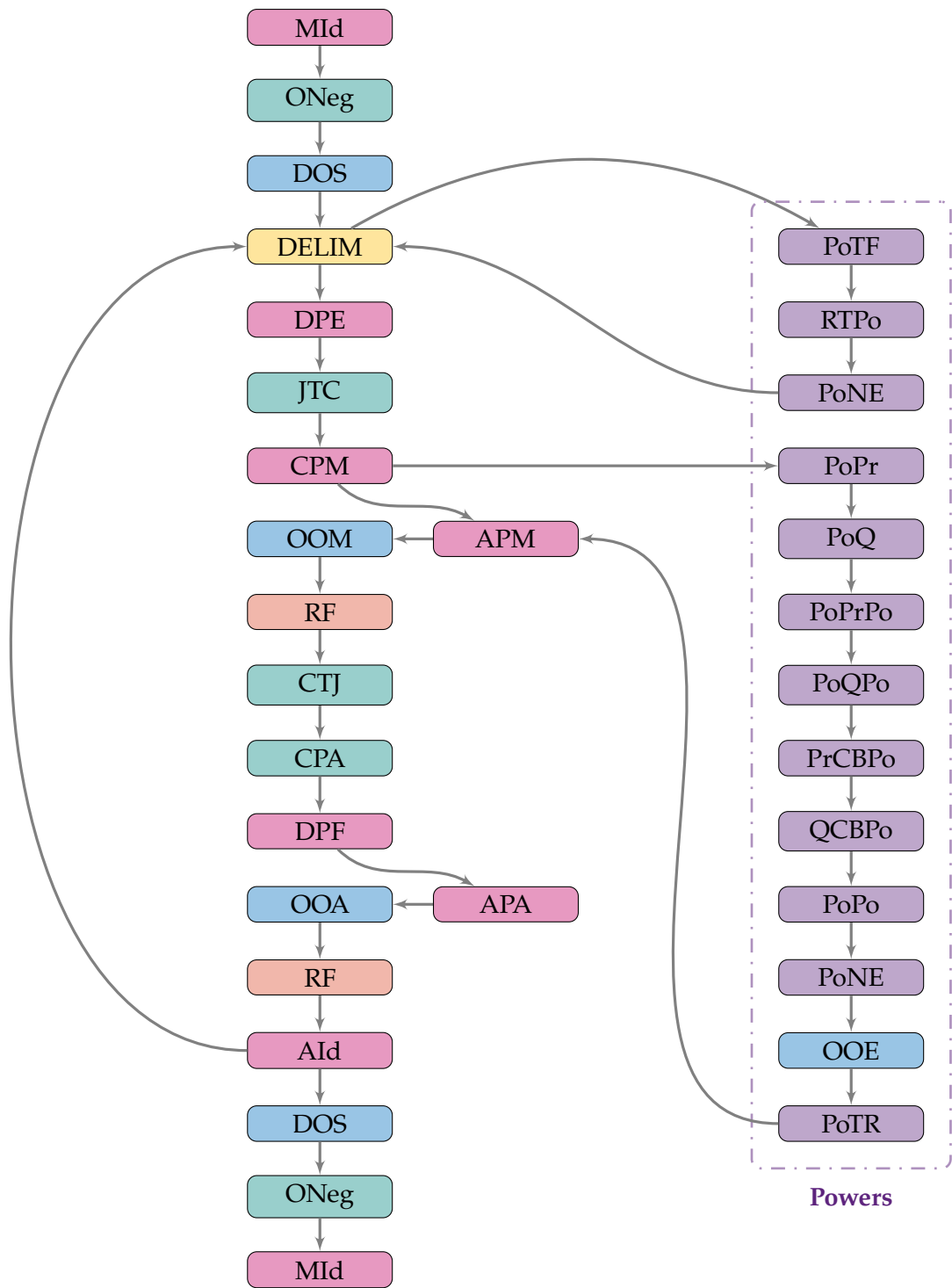


Figure 1.1: Simplifying Expressions Workflow:

■ Property, ■ Operation, ■ Notation, ■ Powers, ■ Delimiters, ■ Process, ■ Not Used

1.2.1 Monomials of Like Terms

1.2.2 Surds

Example 1.1 – id:20141108-085327.

Simplify $2\sqrt{2} - \frac{(\sqrt{2})^3}{3} - \left(2(-\sqrt{2}) - \frac{(-\sqrt{2})^3}{3}\right)$

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Solution:

$$\begin{aligned}
 & 2\sqrt{2} - \frac{1(1\sqrt{2})^3}{3} - 1\left(2(-1\sqrt{2}) - \frac{1(-1\sqrt{2})^3}{3}\right) && \text{MId(??)} \\
 & 2\sqrt{2} - \frac{1(1\sqrt{2})^3}{3} - 1\left(2(-1\sqrt{2}) - \frac{1(-1\sqrt{2})^3}{3}\right) && \text{ONeg(??)} \\
 & 2\sqrt{2} + \frac{-1(1\sqrt{2})^3}{3} + -1\left(2(-1\sqrt{2}) + \frac{-1(-1\sqrt{2})^3}{3}\right) && \text{DOS(??)} \\
 & 2 \cdot 2^{1/2} + \frac{-1(1 \cdot 2^{1/2})^3}{3} + -1\left(2(-1 \cdot 2^{1/2}) + \frac{-1(-1 \cdot 2^{1/2})^3}{3}\right) && \text{RTPo(1.8)} \\
 & 2 \cdot 2^{1/2} + \frac{-1(1 \cdot 2^{1/2})^3}{3} + -1\left(2 \cdot -1 \cdot 2^{1/2} + \frac{-1(-1 \cdot 2^{1/2})^3}{3}\right) && \text{JTC(??)} \\
 & 2 \cdot 2^{1/2} + \frac{-1 \cdot 1 \cdot 2^{3/2}}{3} + -1\left(2 \cdot -1 \cdot 2^{1/2} + \frac{-1 \cdot -1 \cdot 2^{3/2}}{3}\right) && \text{PoPrPo(1.3a)} \\
 & 2 \cdot 2^{1/2} + \frac{-1 \cdot 1 \cdot 2^{2/2} \cdot 2^{1/2}}{3} + -1\left(2 \cdot -1 \cdot 2^{1/2} + \frac{-1 \cdot -1 \cdot 2^{2/2} \cdot 2^{1/2}}{3}\right) && \text{PrCBPo(??)} \\
 & 2 \cdot 2^{1/2} + \frac{-1 \cdot 1 \cdot 2 \cdot 2^{1/2}}{3} + -1\left(2 \cdot -1 \cdot 2^{1/2} + \frac{-1 \cdot -1 \cdot 2 \cdot 2^{1/2}}{3}\right) && \text{MId(??)} \\
 & 2 \cdot \sqrt{2} + \frac{-1 \cdot 1 \cdot 2 \cdot \sqrt{2}}{3} + -1\left(2 \cdot -1 \cdot \sqrt{2} + \frac{-1 \cdot -1 \cdot 2 \cdot \sqrt{2}}{3}\right) && \text{PoTR(1.9)} \\
 & 2 \cdot \sqrt{2} + \frac{-1 \cdot 1 \cdot 2 \cdot \sqrt{2}}{3} + -1 \cdot 2 \cdot -1 \cdot \sqrt{2} + \frac{-1 \cdot -1 \cdot -1 \cdot 2 \cdot \sqrt{2}}{3} && \text{DPE(??)} \\
 & 2 \cdot \sqrt{2} + \frac{-2 \cdot \sqrt{2}}{3} + 2 \cdot \sqrt{2} + \frac{-2 \cdot \sqrt{2}}{3} && \text{OOM(??)} \\
 & 2\sqrt{2} + \frac{-2\sqrt{2}}{3} + 2\sqrt{2} + \frac{-2\sqrt{2}}{3} && \text{CTJ(??)} \\
 & \left(2 + \frac{-2}{3} + 2 + \frac{-2}{3}\right)\sqrt{2} && \text{DPF(??)} \\
 & \frac{8}{3}\sqrt{2} && \text{OOA(??)}
 \end{aligned}$$

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Dependencies:example ??-20141108-083108