

# Factoring

Goal: Completely factor using Rational Root Theorem.

Objective: Create your rational root list.  
Synthetically divide 6 options.

We will complete this on Friday.

$$c) 2x^4 + 3x^3 - 20x^2 - 27x + 18$$

Example:

$$3x^4 - 2x^3 - 13x^2 + 8x + 4$$

→ 4 :  $\frac{1, 2, 4}{1, 3} : \pm 1, 2, 4, \frac{1}{3}, \frac{2}{3}, \frac{4}{3}$

Factor both

(b) Divide top by all bottom

(c) positive and negative answers

Choose 6 numbers to synthetically divide. (on back)

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$$F) 5x^4 - 14x^3 - 23x^2 + 56x + 12$$

Example:

$$3x^4 - 2x^3 - 13x^2 + 8x + 4$$

$$\begin{array}{l} \rightarrow 4 : \frac{1, 2, 4}{1, 3} : \pm 1, 2, 4, \frac{1}{3}, \frac{2}{3}, \frac{4}{3} \\ \rightarrow 3 \end{array}$$

Factor both

(b) Divide top by all bottom

(c) positive and negative answers

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$$B) \quad 2x^4 - 3x^3 - 20x^2 + 27x + 18$$

Example:

$$3x^4 - 2x^3 - 13x^2 + 8x + 4$$

$$\begin{array}{l} \rightarrow 4 \\ \rightarrow 3 \end{array} : \frac{1, 2, 4}{1, 3} : \pm 1, 2, 4, \frac{1}{3}, \frac{2}{3}, \frac{4}{3}$$

Factor both

(b) Divide top by all bottom

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Choose 6 numbers to synthetically divide. (on back)

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$$D) 4x^4 - 3x^3 - 37x^2 + 27x + 9$$

Example:

$$3x^4 - 2x^3 - 13x^2 + 8x + 4$$

$$\begin{array}{l} \rightarrow 4 : \frac{1, 2, 4}{1, 3} : \pm 1, 2, 4, \frac{1}{3}, \frac{2}{3}, \frac{4}{3} \\ \rightarrow 3 : \frac{1, 3}{1, 3} : \pm 1, 3 \end{array}$$

Factor both

(b) Divide top by all bottom

(c) positive and negative answers

Choose 6 numbers to synthetically divide. (on back)

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$$1 \left| \begin{array}{cccc|c} 3 & -2 & -13 & 8 & 4 \\ & 3 & 1 & -12 & -4 \\ \hline 3 & 1 & -12 & -4 & 0 \end{array} \right. \star$$

$$-1 \left| \begin{array}{cccc|c} 3 & -2 & -13 & 8 & 4 \\ & -3 & 5 & 8 & -16 \\ \hline 3 & -5 & -8 & 16 & -12 \end{array} \right. \text{no good}$$

$$2 \left| \begin{array}{cccc|c} 3 & -2 & -13 & 8 & 4 \\ & 6 & 8 & -10 & -4 \\ \hline 3 & 4 & -5 & -2 & 0 \end{array} \right. \star$$

$$4 \left| \begin{array}{cccc|c} 3 & -2 & -13 & 8 & 4 \\ & 12 & 40 & 108 & 464 \\ \hline 3 & 10 & 27 & 116 & 468 \end{array} \right. \text{no good}$$

$$\frac{1}{3} \left| \begin{array}{cccc|c} 3 & -2 & -13 & 8 & 4 \\ & 1 & -\frac{1}{3} & -\frac{40}{9} & \frac{32}{27} \\ \hline 3 & -1 & -\frac{40}{3} & \frac{32}{9} & \frac{140}{27} \end{array} \right. \text{no good}$$

$$-\frac{1}{3} \left| \begin{array}{cccc|c} 3 & -2 & -13 & 8 & 4 \\ & -1 & 1 & 4 & -4 \\ \hline 3 & -3 & -12 & 12 & 0 \end{array} \right. \star$$