Section 5-4
Dividing Polynomials

Students will be able to divide polynomials using long division and synthetic division.

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We are going to look at how to use long division to divide polynomials.

When you factor a polynomial, you are trying to find a divisor of the polynomial that gives a quotient (other factor) and remainder 0.
-suggests that being able to divide one polynomial by another can help factor.

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Divide using long division:

$21\overline{)672}$

32
63
42
42
0

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Using the same steps, divide:

$2x + 1 \overline{)6x^2 + 7x + 2}$

$3x + 2$
$-6x^2 + 3x$
$4x + 2$
$-4x + 2$
0

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Use long division to divide $3x^2 - 29x + 56$ by $x - 7$

$3x - 8$
$x - 7 \overline{)3x^2 - 29x + 56}$
$-3x^2 + 21x$
$-8x + 56$
$-+8x \mp 56$
0

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Divide $5x^2 + 2x + 3$ by $x + 1$

$5x - 3$, R 6
$x + 1 \overline{)5x^2 + 2x + 3}$
$-5x^2 + 5x$
$-3x + 3$
$--3x - 3$
6

$3 + 3$

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We can use division to check for factors.

Is $x^4 - 1$ a factor of $P(x) = x^5 + 5x^4 - x - 5$? If it is, write it as a product of two factors.

$x + 5$ Yes $(x+5)(x^4-1)$

$x^4 - 1 \overline{)\, x^5 + 5x^4 - x - 5}$

$-x^5 \quad + x$

$5x^4 - 5$

$-5x^4 \quad +5$

0

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Is $x^2 + 1$ a factor of $3x^4 - 4x^3 + 12x^2 + 5$

$3x^2 - 4x + 9$ R $4x - 4$

$x^2 + 1 \overline{)\, 3x^4 - 4x^3 + 12x^2 + 0x + 5}$

$-3x^4 \quad +3x^2$

$-4x^3 + 9x^2 + 0x + 5$

$-(-4x^3 \quad -4x)$

$9x^2 + 4x + 5$

$-(9x^2 \quad +9)$

$4x - 4$

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