3-8 Polynomial Long Division

$$2\overline{)13}$$
$$-12$$
$$1$$

6 r 1 $\quad 6\tfrac{1}{2} \quad 6.5$

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The process of long division

Divide 1436 by 8

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Polynomial Long Division

- **When you divide polynomial f(x) by a divisor d(x), you get a quotient polynomial q(x) and a remainder polynomial r(x).**

Dividend, divisor

$$\frac{f(x)}{d(x)} = q(x) + \frac{r(x)}{d(x)}$$

divisor $\overline{)\text{Dividend}}$ Quotient

* The degree of the remainder must be less than the degree of the divisor. One way to divide polynomials is called Polynomial Long Division

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Use polynomial long

Divide $3x^4 - 5x^3 + 0x^2 + 4x - 6$ (Dividend) by $x_2 - 3x + 5$ (divisor)

$x^2 \cdot 3x^2 = 3x^4$

$x^2 \cdot 4x = 4x^3$

$x^2 \cdot 3 = -3x^2$

quotient: $3x^2 - 4x - 3$

$$x^2 - 3x + 5\overline{)3x^4 - 5x^3 + 0x^2 + 4x - 6}$$
$$-(3x^4 - 9x^3 + 15x^2)$$
$$4x^3 - 15x^2 + 4x - 6$$
$$-(4x^3 - 12x^2 + 20x)$$
$$-3x^2 - 16x - 6$$
$$-(-3x^2 + 9x - 15)$$
$$-25x + 9$$

$3x^2(x^2 - 3x + 5)$

$3x^4 - 9x^3 + 15x^2$

$4x(x^2 - 3x + 5)$

$4x^3 - 12x^2 + 20x$

$3(x^2 - 3x + 5)$

1. factor
2. Mult.
3. Subtract — Add opp, zap zap
4. Bring Down

Remainder written as a fraction

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$x \cdot x^2 = x^3$

Divide $f(x) = x^3 + 5x^2 - 7x + 2$ by $x - 2$.

$x \cdot 7x = 7x^2$

$x \cdot 7 = 7x$

$$x^2 + 7x + 7 + \frac{16}{x-2}$$

$$x - 2 \overline{)\,x^3 + 5x^2 - 7x + 2}$$

$-x^3 + 2x^2$

$7x^2 - 7x$

$-7x^2 + 14x$

$\cancel{7x} + 2$

$-\cancel{7x} + 14$

16

$x^2(x-2)$

$x^3 - 2x^2$

$7x(x-2)$

$7x^2 - 14x$

$7(x-2)$

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$$5x^2 + 2x + 3 + \frac{2}{x-2}$$

$$x - 2 \overline{)\,5x^3 - 8x^2 - x - 4}$$

$-5x^3 + 10x^2$

$2x^2 - x - 4$

$-2x^2 + 4x$

$3x - 4$

$-3x + 6$

2

$x \cdot 5x^2 = 5x^3$

$x \cdot 2x = 2x^2$

$x \cdot 3 = 3x$

$5x^2(x-2)$

$5x^3 - 10x^2$

$2x(x-2)$

$3(x-2)$

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Divide using polynomial long division.
Check for missing terms!!

1. $(2x^4 + x^3 + x - 1) \div (x^2 + 2x - 1)$

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Divide using polynomial long division.

2. $(x^3 - x^2 + 4x - 10) \div (x + 2)$

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