Now that we have seen how to • Add and Subtract and • Multiply Polynomials, we will look at an example of Dividing Polynomials

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We will follow a similar algorithm as Long Division of numbers

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

Now that we have seen how to Add and Subtract and Multiply Polynomials, we will look at an example of Dividing Polynomials. We will follow a similar algorithm as Long Division of numbers

Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

$$(x^2-2)$$
 $2x^3-3x^2+5x+1$

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

$$(x^2 - 2) \overline{2x^3 - 3x^2 + 5x + 1} \qquad \frac{2x^3}{x^2} = 2x$$

First we divide the lead terms: $\frac{2x^3}{x^2} = 2x$

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$$\frac{2x^3}{x^2} = 2x$$

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

$$\frac{2x}{(x^2-2)^3 - 3x^2 + 5x + 1}$$
 First we calculate $\frac{2x^3}{x^2} = 2x$

Next we multiply
$$2x \cdot (x^2 - 2)$$
 and subtract

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

$$\begin{array}{rcl}
 & 2x & \text{First we of } \\
 & 2x^3 - 3x^2 + 5x + 1 & \frac{2x^3}{x^2} = 2x \\
 & -2x^3 & +4x & \text{Next we of } \\
\end{array}$$

Next we multiply
$$2x \cdot (x^2 - 2)$$
 and subtract

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

$$\begin{array}{c|c} & 2x & \text{First we divide the lead terms:} \\ x^2-2) & 2x^3-3x^2+5x+1 & \frac{2x^3}{x^2}=2x \\ & -2x^3 & +4x & \text{Next we multiply } 2x\cdot (x^2-2) \\ & -3x^2+9x+1 & \text{and subtract} \end{array}$$

Next we multiply
$$2x \cdot (x^2 - 2)$$
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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

$$(x^2-2) \begin{tabular}{ll} \hline & 2x \\ \hline & 2x^3-3x^2+5x+1 \\ \hline & -2x^3 & +4x \\ \hline & -3x^2+9x+1 \end{tabular} \begin{tabular}{ll} First we divide the lead terms: \\ \hline & \frac{2x^3}{x^2}=2x \\ \hline & Next we multiply $2x\cdot(x^2-2)$ and subtract$$

$$\frac{2x^3}{x^2} = 2x$$
Next we multiply $2x \cdot (x^2 - 2)$ and subtract
Now we have a lower degree

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

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

$$-2x^{3} + 4x$$

$$-3x^{2}+9x+1$$
First we divide the lead terms:
$$\frac{2x^{3}}{x^{2}}=2x$$
Next we multiply $2x \cdot (x^{2}-2)$ and subtract

and subtract Now we have a lower degree Now we repeat this process.

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

First we divide the lead terms: Now we have a lower degree Now we repeat this process. Dividing the new lead terms: $\frac{-3x^2}{1.2} = -3$

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

$$\begin{array}{c}
2x - 3 \\
x^2 - 2) \overline{)2x^3 - 3x^2 + 5x + 1} \\
\underline{-2x^3 + 4x} \\
-3x^2 + 9x + 1
\end{array}$$
First we can be a subtraction of the first weight and the first weight and the first weight and the first weight are a subtraction of the first weight and the first weight and the first weight and the first weight are a subtraction of the first weight and the first weight are a subtraction of the first weight and the first weight are a subtraction of the first weight and the first weight are also as a subtraction of the first weight are a subtraction of the first weight are also as a subtraction of the first weight are a subtraction of the first weight are a subtraction of the first weight and the first weight are also as a subtraction of the first weight are also as a subtraction of the first weight and the first weight are also as a subtraction of the first weight are also as a subtraction of the first weight and the first weight are a subtraction of the first weight are also as a subtraction of the first weight are also as a subtraction of the first weight are also as a subtraction of the first weight are also as a subtraction of the first weight are also as a subtraction of the first weight are also as a subtraction of the first weight are also as a subtraction of the first weight are also as a subtraction of the first weight are a

 $\frac{2x^3}{x^2} = 2x$ Next we multiply $2x \cdot (x^2 - 2)$ and subtract
Now we have a lower degree
Now we repeat this process.
Dividing the new lead terms: $\frac{-3x^2}{x^2} = -3$

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

Next we multiply $2x \cdot (x^2 - 2)$ and subtract
Now we have a lower degree
Now we repeat this process.
Dividing the new lead terms:

 $\frac{-3x^2}{1.2} = -3$

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$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

 $\frac{2x^3}{x^2} = 2x$ Next we multiply $2x \cdot (x^2 - 2)$ and subtract
Now we have a lower degree
Now we repeat this process.
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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

First we divide the lead terms:
$$\frac{2x^3}{x^2} = 2x$$

Next we multiply $2x \cdot (x^2 - 2)$ and subtract
Now we have a lower degree
Now we repeat this process.
Dividing the new lead terms: $\frac{-3x^2}{x^2} = -3$

Once the degree of what is being divided is smaller than the degree we are dividing by, the process is complete:

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

$$\frac{2x-3}{2x^3-3x^2+5x+1} = \frac{2x^3}{x^2} = 2x$$

$$\frac{-2x^3}{3x^2+9x+1} = \frac{-3x^2+9x+1}{3x^2-6} = \frac{3x^2-6}{9x-5}$$
Next we and subtraction Now we have a now we have a subtraction of the content of the

$$\frac{2x^3}{x^2} = 2x$$
Next we multiply $2x \cdot (x^2 - 2)$ and subtract
Now we have a lower degree
Now we repeat this process.
Dividing the new lead terms:
$$\frac{-3x^2}{x^2} = -3$$

First we divide the lead terms:

Once the degree of what is being divided is smaller than the degree we are dividing by, the process is complete:

Conclusion:
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2} = 2x - 3 + \frac{9x - 5}{x^2 - 2}$$

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Example 1: Simplify
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2}$$

$$\frac{2x-3}{2x^3-3x^2+5x+1} = \frac{2x-3}{-2x^3} + \frac{4x}{-3x^2+9x+1} = \frac{-3x^2+9x+1}{3x^2-6}$$
 Next we multiply $2x \cdot (x^2-2)$ and subtract Now we have a lower degree Now we repeat this process. Dividing the new lead terms:
$$\frac{-3x^2}{x^2} = -3$$
 Once the degree of what is being divided is smaller than the degree of the process.

Once the degree of what is being divided is smaller than the degree we are dividing by, the process is complete:

Conclusion:
$$\frac{2x^3 - 3x^2 + 5x + 1}{x^2 - 2} = 2x - 3 + \frac{9x - 5}{x^2 - 2}$$

Note: 2x - 3 is called the Quotient and 9x - 5 the Remainder