## Long Division of Polynomials - Example 2

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## Long Division of Polynomials - Example 2

Now that we have seen how to Addend subrect and
Mmidity Polynomials, we will look at an example of Dividing Polynomials
We will follow a similar algorithm as Long Division of numbers
Example 2: Simplify $\frac{2 x^{3}-3 x^{2}+5 x+1}{x-3}$

## Long Division of Polynomials - Example 2

Now that we have seen how to And and subtrate and
Mmidity Polynomials, we will look at an example of Dividing Polynomials
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Example 2: Simplify $\frac{2 x^{3}-3 x^{2}+5 x+1}{x-3}$

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

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Example 2: Simplify $\frac{2 x^{3}-3 x^{2}+5 x+1}{x-3}$
First we divide the lead terms:

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

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$$
\begin{array}{cc}
\frac{2 x^{2}}{}(-3) & \begin{array}{l}
\text { First we di } \\
\frac{2 x^{3}}{x}=2 x^{3}-3 x^{2}+5 x+1
\end{array}
\end{array}
$$

First we divide the lead terms:

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

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

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$$
\begin{aligned}
&x-3) \frac{2 x^{2}}{2 x^{3}-3 x^{2}+5 x+1} \\
&-2 x^{3}+6 x^{2}
\end{aligned}
$$

First we divide the lead terms:
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$$
\begin{gathered}
x-3) \begin{array}{r}
\frac{2 x^{2}}{2 x^{3}-3 x^{2}+5 x+1} \\
-2 x^{3}+6 x^{2} \\
3 x^{2}
\end{array}+5 x
\end{gathered}
$$

First we divide the lead terms:
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\begin{gathered}
x-3) \begin{array}{r}
\frac{2 x^{2}}{2 x^{3}-3 x^{2}+5 x+1} \\
-2 x^{3}+6 x^{2} \\
3 x^{2}
\end{array}+5 x
\end{gathered}
$$

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

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

$$
\begin{gathered}
x-3) \frac{2 x^{2}}{2 x^{3}-3 x^{2}+5 x+1} \\
-2 x^{3}+6 x^{2} \\
3 x^{2} \\
-5 x
\end{gathered}
$$

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

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$$
\begin{gathered}
x-3) \frac{2 x^{2}}{2 x^{3}-3 x^{2}+5 x+1} \\
-\frac{2 x^{3}+6 x^{2}}{3 x^{2}}+5 x
\end{gathered}
$$

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

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$$
x-3) \frac{2 x^{2}+3 x}{2 x^{3}-3 x^{2}+5 x+1}+\frac{2 x^{3}+6 x^{2}}{3 x^{2}+5 x}
$$

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

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

$$
x-3) \frac{2 x^{2}+3 x}{2 x^{3}-3 x^{2}+5 x+1}+\begin{gathered}
-2 x^{3}+6 x^{2} \\
3 x^{2}+5 x \\
-3 x^{2}+9 x
\end{gathered}
$$

First we divide the lead terms:

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

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

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

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$$
x-3) \begin{array}{r}
\frac{2 x^{2}+3 x}{2 x^{3}-3 x^{2}+5 x+1} \\
-2 x^{3}+6 x^{2} \\
3 x^{2}+5 x \\
\frac{-3 x^{2}+9 x}{14 x}+1
\end{array}
$$

First we divide the lead terms:
$\frac{2 x^{3}}{x}=2 x^{2}$
Next we multiply $2 x^{2} \cdot(x-3)$ and subtract
Now we have a lower degree
Now we repeat this process.
Dividing the new lead terms:
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\frac{2 x^{2}+3 x}{2 x^{3}-3 x^{2}+5 x+1} \\
-2 x^{3}+6 x^{2} \\
3 x^{2}+5 x \\
\frac{-3 x^{2}+9 x}{14 x}+1
\end{array}
$$

First we divide the lead terms:
$\frac{2 x^{3}}{x}=2 x^{2}$
Next we multiply $2 x^{2} \cdot(x-3)$ and subtract
Now we have a lower degree
Now we repeat this process.
Dividing the new lead terms:
$\frac{3 x^{2}}{x}=3 x$
Dividing the new lead terms:
$\frac{14 x}{x}=14$

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

$$
x-3) \begin{array}{ll}
\frac{2 x^{2}+3 x+14}{2 x^{3}-3 x^{2}+5 x+1} & \begin{array}{l}
\frac{\text { First we divide the lead terms: }}{x}=2 x^{2}
\end{array} \\
-2 x^{3}+6 x^{2} & \text { Next we multiply } 2 x^{2} \cdot(x-3) \\
-3 x^{2}+5 x & \text { and subtract } \\
-3 x^{2}+9 x & \text { Now we have a lower degree } \\
& \\
& \\
& \text { Now we repeat this process. } \\
& \text { Dividing the new lead terms: } \\
& \frac{3 x^{2}}{x}=3 x \\
& \text { Dividing the new lead terms: } \\
& \frac{14 x}{x}=14
\end{array}
$$

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

$$
\begin{aligned}
& 2 x^{2}+3 x+14 \quad \text { First we divide the lead terms: } \\
& x-3) \quad 2 x^{3}-3 x^{2}+5 x+1 \\
& \frac{2 x^{3}}{x}=2 x^{2} \\
& \text { Next we multiply } 2 x^{2} \cdot(x-3) \\
& \text { and subtract } \\
& \text { Now we have a lower degree } \\
& \text { Now we repeat this process. } \\
& \text { Dividing the new lead terms: } \\
& \frac{3 x^{2}}{x}=3 x \\
& \text { Dividing the new lead terms: } \\
& \frac{14 x}{x}=14
\end{aligned}
$$

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$$
\begin{aligned}
& \text { Dividing the new lead terms: } \\
& \frac{14 x}{x}=14
\end{aligned}
$$

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$$
x-3) \begin{aligned}
\frac{2 x^{2}+3 x+14}{2 x^{3}-3 x^{2}+5 x+1} & \begin{array}{l}
\frac{\text { First we divide the lead terms: }}{x}=2 x^{2}
\end{array} \\
\frac{2 x^{3}+6 x^{2}}{x} & \text { Next we multiply } 2 x^{2} \cdot(x-3) \\
-3 x^{2}+5 x & \text { and subtract } \\
-3 x^{2}+9 x & \text { Now we have a lower degree } \\
\frac{-14 x}{}+\frac{1}{2} & \text { Now we repeat this process. } \\
43 & \begin{array}{l}
\text { Dividing the new lead terms: } \\
\\
\\
\frac{3 x^{2}}{x}=3 x
\end{array}
\end{aligned}
$$

Dividing the new lead terms:

$$
\frac{14 x}{x}=14
$$

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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$$
x-3) \begin{aligned}
\frac{2 x^{2}+3 x+14}{2 x^{3}-3 x^{2}+5 x+1} & \begin{array}{l}
\text { First we divide the lead terms: } \\
\frac{2 x^{3}}{x}=2 x^{2}
\end{array} \\
-2 x^{3}+6 x^{2} & \text { Next we multiply } 2 x^{2} \cdot(x-3) \\
3 x^{2}+5 x & \text { and subtract } \\
-3 x^{2}+9 x & \text { Now we have a lower degree } \\
\frac{-14 x}{}+14 x+42 & \text { Now we repeat this process. } \\
& \begin{array}{l}
\text { Dividing the new lead terms: } \\
\\
\\
\\
\frac{3 x^{2}}{x}=3 x
\end{array}
\end{aligned}
$$

Dividing the new lead terms:

$$
\frac{14 x}{x}=14
$$

Once the degree of what is being divided is smaller than the degree we are dividing by, the process is complete:
Conclusion: $\frac{2 x^{3}-3 x^{2}+5 x+1}{x-3}=2 x^{2}+3 x+14+\frac{43}{x-3}$

