## Unit 2 Lesson 12: Polynomial Division (Part 1)

### 1 Notice and Wonder: A Different Use for Diagrams (Warm up)

#### Student Task Statement

What do you notice? What do you wonder?

A. $(x−3)(x+5)=x^{2}+2x−15$

|  |  |  |
| --- | --- | --- |
|  | $x$ | 5 |
| $x$ | $x^{2}$ | $5x$ |
| -3 | $-3x$ | -15 |

B. $(x−1)(x^{2}+3x−4)=x^{3}+2x^{2}−7x+4$

|  |  |  |  |
| --- | --- | --- | --- |
|  | $x^{2}$ | $3x$ | -4 |
| $x$ | $x^{3}$ | $3x^{2}$ | $-4x$ |
| -1 | $-x^{2}$ | $-3x$ | +4 |

C. $(x−2)(?)=(x^{3}−x^{2}−4x+4)$

|  |  |  |  |
| --- | --- | --- | --- |
|  |               |                |                |
| $x$ | $x^{3}$ |  |  |
| -2 |  |  |  |

### 2 Factoring with Diagrams

#### Student Task Statement

Priya wants to sketch a graph of the polynomial $f$ defined by $f(x)=x^{3}+5x^{2}+2x−8$. She knows $f(1)=0$, so she suspects that $(x−1)$ could be a factor of $x^{3}+5x^{2}+2x−8$ and writes $(x^{3}+5x^{2}+2x−8)=(x−1)(?x^{2}+?x+?)$ and draws a diagram.

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|   |               |               |               |
| $x$ | $x^{3}$ |   |   |
| -1 |   |   |   |

1. Finish Priya’s diagram.
2. Write $f(x)$ as the product of $(x−1)$ and another factor.
3. Write $f(x)$ as the product of three linear factors.
4. Make a sketch of $y=f(x)$.



### 3 More Factoring with Diagrams

#### Student Task Statement

Here are some polynomial functions with known factors. Rewrite each polynomial as a product of linear factors. Note: you may not need to use all the columns in each diagram. For some problems, you may need to make another diagram.

1. $A(x)=x^{3}−7x^{2}−16x+112$, $(x−7)$

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| --- | --- | --- | --- | --- | --- |
| *
 | * $x^{2}$
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 | *
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 | *
 |
| * $x$
 | * $x^{3}$
 | * 0
 | *
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 | *
 |
| * -7
 | * $-7x^{2}$
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1. $B(x)=2x^{3}−x^{2}−27x+36$, $\left(x−\frac{3}{2}\right)$

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *
 | * $2x^{2}$
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 | *
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 | *
 |
| * $x$
 | * $2x^{3}$
 | * $2x^{2}$
 | *
 | *
 | *
 |
| * $-\frac{3}{2}$
 | * $-3x^{2}$
 | *
 | *
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 |

1. $C(x)=x^{3}−3x^{2}−13x+15$, $(x+3)$

|  |  |  |  |  |  |
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| * $x$
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1. $D(x)=x^{4}−13x^{2}+36$, $(x−2)$, $(x+2)$
* (Hint: $x^{4}−13x^{2}+36=x^{4}+0x^{3}−13x^{2}+0x+36$)

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1. $F(x)=4x^{4}−15x^{3}−48x^{2}+109x+30$, $(x−5)$, $(x−2)$, $(x+3)$

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