## 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. $\left(x−3\right)\left(x+5\right)=x^{2}+2x−15$

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

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

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

C. $\left(x−2\right)\left(?\right)=\left(x^{3}−x^{2}−4x+4\right)$

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

### 2 Factoring with Diagrams

#### Student Task Statement

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

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

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



### 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. $A\left(x\right)=x^{3}−7x^{2}−16x+112$, $\left(x−7\right)$

| *
 | * $x^{2}$
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 | *
 |
| --- | --- | --- | --- | --- | --- |
| * $x$
 | * $x^{3}$
 | * 0
 | *
 | *
 | *
 |
| * -7
 | * $-7x^{2}$
 | *
 | *
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 |

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

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

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

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

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

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