

15.3 Dividing Polynomials

Long Division

- ① Divide the leading terms to figure out what goes on top.
- ② Multiply the divisor (outside) by # you got from part ① & place results under dividend (inside).
- ③ Subtract (or change all signs)
- ④ Bring down next term.
- ⑤ Restart.

Add zero when there is a missing term.

Ex #1 Divide $\frac{592}{46}$.

$$12 + \frac{40}{46} \Rightarrow \boxed{12 \frac{20}{23}}$$

$$\begin{array}{r} 46 \overline{) 592} \\ \underline{-46} \\ 132 \\ \underline{-92} \\ 40 \end{array}$$

Ex #2 Divide $x^3 - 7x^2 + 14$ by $x - 5$.

$$\boxed{x^2 - 2x - 10 + \frac{-36}{x-5}}$$

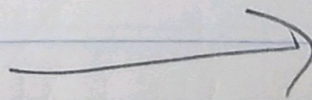
$$\begin{array}{r} x-5 \overline{) x^3 - 7x^2 + 0x + 14} \\ \underline{-x^3 + 5x^2} \\ -2x^2 + 0x \\ \underline{+2x^2 - 10x} \\ -10x + 14 \\ \underline{+10x - 50} \\ -36 \end{array}$$

Ex #3 Divide $x^3 - x^2 - 6x + 18$ by $x + 3$.

$$\begin{array}{r}
 \boxed{x^2 - 4x + 6} \\
 x+3 \overline{) x^3 - x^2 - 6x + 18} \\
 \underline{-x^3 + 3x^2} \quad \downarrow \\
 -4x^2 - 6x \\
 \underline{+4x^2 + 12x} \quad \downarrow \\
 6x + 18 \\
 \underline{-6x + 18} \\
 0
 \end{array}$$

Ex #4

$$\begin{array}{r}
 \boxed{-2x^3 - 9x^2 - 17x - 26 + \frac{84}{-2x+3}} \\
 -2x+3 \overline{) 4x^4 + 12x^3 + 7x^2 + x + 6} \\
 \underline{-4x^4 + 6x^3} \quad \downarrow \\
 18x^3 + 7x^2 \\
 \underline{-18x^3 + 27x^2} \quad \downarrow \\
 34x^2 + x \\
 \underline{-34x^2 + 51x} \quad \downarrow \\
 52x + 6 \\
 \underline{-52x + 78} \\
 84
 \end{array}$$



Ex #5

$$\begin{array}{r}
 \boxed{x^2 - 3x + 10 + \frac{-14}{x+2}} \\
 x+2 \overline{) x^3 - x^2 + 4x + 6} \\
 \underline{-x^3 + 2x^2} \quad \downarrow \\
 -3x^2 + 4x \\
 \underline{+3x^2 + 6x} \quad \downarrow \\
 10x + 6 \\
 \underline{-10x - 20} \\
 -14
 \end{array}$$

Ex #6 Divide $6x^4 + 3x^3 + 13x^2 - x - 5$ by $3x^2 - 1$.

$$\begin{array}{r}
 \boxed{2x^2 + x + 5} \\
 3x^2 + 0x - 1 \overline{) 6x^4 + 3x^3 + 13x^2 - x - 5} \\
 \underline{-6x^4 + 0x^3 + 2x^2} \quad \downarrow \\
 3x^3 + 15x^2 - x \\
 \underline{-3x^3 + 0x^2 + x} \quad \downarrow \\
 15x^2 + 0x - 5 \\
 \underline{-15x^2 + 0x + 5} \\
 0
 \end{array}$$