

Non Linear Divisor

$$\begin{array}{r} 20 \\ 5 \overline{) 128} \\ \underline{100} \\ 28 \end{array}$$

$$\begin{aligned} x^4 &= x \cdot x \cdot x \cdot x \\ &= x^2 \cdot x^2 \\ &= x^{2+2} \end{aligned}$$

$$\begin{aligned} x^2 \cdot x &= x \cdot x \cdot x \\ &= x^3 \end{aligned}$$

ex. $\frac{10x^4 - 15x^2 + 5}{2x^2 - 1}$
all missing terms must be accounted for!

$$\begin{array}{r} 5x^2 - 5 \\ 2x^2 + 0x - 1 \overline{) 10x^4 + 0x^3 - 15x^2 + 0x + 5} \\ \underline{-(10x^4 + 0x^3 - 5x^2)} \\ -10x^2 + 0x + 5 \\ \underline{-(-10x^2 + 0x + 5)} \\ 0 \end{array}$$

$$\frac{10x^4 - 15x^2 + 5}{(2x^2 - 1)(5x^2 - 5)}$$

When you get 0 as a remainder, then the dividend is factorable

$$\frac{10r^5 + 6r^4 - 5r^2 - 20r}{2r^2 - 4r + 1}$$

$$\begin{array}{r} \times 2 \\ 5 \overline{) 128} \end{array}$$

$$\begin{array}{r} 5r^3 + 13r^2 + 23.5r + 38 + \frac{108.5r - 38}{2r^2 - 4r + 1} \\ 2r^2 - 4r + 1 \overline{) 10r^5 + 6r^4 + 0r^3 - 5r^2 - 20r + 0} \\ \underline{-(10r^5 - 20r^4 + 5r^3)} \\ 26r^4 - 5r^3 - 5r^2 - 20r + 0 \\ \underline{-(26r^4 - 52r^3 + 13r^2)} \\ 47r^3 - 18r^2 - 20r + 0 \\ \underline{-(47r^3 - 94r^2 + 23.5r)} \\ 76r^2 - 43.5r + 0 \\ \underline{-(76r^2 - 152r + 38)} \\ 108.5r - 38 \end{array}$$

$$\frac{n^3 - 4n^2 - 5}{n^2 - 5}$$

$$\begin{array}{r}
 n^2 + 0n - 5 \overline{) n^3 - 4n^2 + 0n - 5} \\
 \underline{-(n^3 + 0n^2 - 5n)} \\
 -4n^2 + 5n - 5 \\
 \underline{-(-4n^2 + 0n + 20)} \\
 5n - 25
 \end{array}$$

$n - 4 + \frac{5n - 25}{n^2 - 5}$

Same
degree on
Bottom as
top

$$\frac{25 - n^3}{n^3 - 4n - 5}$$

$$\begin{array}{r}
 n^3 + 0n^2 - 4n - 5 \overline{) -n^3 + 0n^2 + 0n + 25} \\
 \underline{-(-n^3 - 0n^2 + 4n + 5)} \\
 -4n + 20
 \end{array}$$

$-1 + \frac{-4n + 20}{n^3 - 4n - 5}$

or $-1 - \frac{4n - 20}{n^3 - 4n - 5}$ negative would be distributed

ex.

$$\begin{array}{r}
 2x^3 + 4x^2 + 8 \\
 \hline
 x^2 - 2 \overline{) 2x^5 + 4x^4 - 4x^3 - x - 3} \\
 \underline{-(2x^5 - 4x^3)} \\
 4x^4 + 4x^3 \\
 \underline{-(4x^4 - 8x^2)} \\
 4x^3 + 8x^2 - 4x^3 \\
 8x^2 - x \\
 \underline{-(8x^2 - 16)} \\
 -x + 16 - 3 \\
 -x + 13
 \end{array}$$

$$\frac{P(x)}{D(x)} = 2x^3 + 4x^2 + 8 + \frac{-x + 13}{x^2 - 2}$$

ex.

$$\begin{array}{r}
 x^3 - x + 1 \\
 \hline
 x^2 + x - 1 \overline{) x^5 + x^4 - 2x^3 + x + 1} \\
 \underline{-(x^5 + x^4 - x^3)} \\
 0 + 0 - x^3 + x \\
 \underline{-(-x^3 - x^2 + x)} \\
 +x^2 + 1 \\
 \underline{-(x^2 + x - 1)} \\
 -x + 2
 \end{array}$$

$$\frac{P(x)}{D(x)} = x^3 - x + 1 + \frac{-x + 2}{x^2 + x - 1}$$

Assignment:

Textbook pg. 177 # 7-10

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

8. $7x + 1 + \frac{-6x - 1}{x^2 + 1}$

9. $5x^2 - 12x + 37 + \frac{-122x + 109}{x^2 + 2x - 4}$

10. $4x^2 + 12x + 44 + \frac{161x + 84}{x^2 - 3x - 2}$
