

# DIVIDING POLYNOMIALS

$$\frac{2x^4 - 6x^2 - x - 1}{x - 2}$$

$$\begin{array}{r} 43\frac{2}{9} \\ 9 \overline{) 389} \\ \underline{-36} \phantom{0} \\ 29 \\ \underline{-27} \\ 2 \end{array}$$

Long Division

$$2x^3 + 4x^2 + 2x + 3 + \frac{5}{x-2}$$

$$\begin{array}{r} x-2 \overline{) 2x^4 + 0x^3 - 6x^2 - x - 1} \\ \underline{-2x^4 + 4x^3} \phantom{-1} \\ 4x^3 - 6x^2 - x - 1 \\ \underline{-4x^3 + 8x^2} \phantom{-1} \\ 2x^2 - x - 1 \\ \underline{-2x^2 + 4x} \phantom{-1} \\ 3x - 1 \\ \underline{-3x + 6} \\ 5 \end{array}$$

change signs →

\* Dividing Polyn.  
\* Function Ops



# SYNTHETIC DIVISION — only works if dividing by $x + \#$ or $x - \#$

$$\frac{2x^4 - 6x^2 - x - 1}{x - 2}$$

$$x - 2$$

Switch  
sign →

$$2$$

$$\begin{array}{r}
 2 \quad 0 \quad -6 \quad -1 \quad -1 \\
 + \quad \nearrow 4 \quad \nearrow 8 \quad \nearrow 4 \quad \nearrow 6 \\
 \hline
 2 \quad 4 \quad 2 \quad 3 \quad 5
 \end{array}$$

$$2x^3 + 4x^2 + 2x + 3 + \frac{5}{x-2}$$

Start by  
dropping the  
first number  
below the line

# FUNCTION OPERATIONS

$$f(x) = x^2 + 3x + 2 \quad g(x) = 3x^2 - x + 7$$

$$f(-3) = (-3)^2 + 3(-3) + 2 \\ = 9 + -9 + 2 = \textcircled{2}$$

$$(f+g)(x) = x^2 + 3x + 2 + 3x^2 - x + 7 \\ 4x^2 + 2x + 9$$

$$(f+g)(1) = 4(1)^2 + 2(1) + 9 = \\ 4 + 2 + 9 = \textcircled{15}$$

$$f(x) \quad k(x) = 3x + 2 \quad m(x) = x^2 - 2x + 4 \quad p(x) = \frac{1}{x-2}$$

$$(km)(x) = (3x+2)(x^2-2x+4) \\ = 3x^3 - 6x^2 + 12x + 2x^2 - 4x + 8 \\ = 3x^3 - 4x^2 + 8x + 8$$

$$\frac{4}{\frac{1}{3}} = 4 \cdot \frac{3}{1}$$

$$\left(\frac{k}{p}\right)(x) = \frac{3x+2}{\frac{1}{x-2}} = (3x+2) \cdot \left(\frac{x-2}{1}\right) \\ = 3x^2 - 6x + 2x - 4 \\ = 3x^2 - 4x - 4$$

$$\frac{3x+2}{x-4}$$

## COMPOSITION OF FUNCTIONS - Function in a function

$$f(x) = 3x + 2 \quad g(x) = x^2 - 2x + 4 \quad h(x) = \frac{3x^2 + 2}{x^2 - 1} \quad k(x) = \sqrt{2x + 1}$$

$$f[g(x)] = (f \circ g)(x)$$

f of g of x

$$f[g(2)]$$

$$g(2) = 2^2 - 2(2) + 4$$

$$= 4 - 4 + 4 = 4$$

$$f(4) = 3(4) + 2$$

$$= 12 + 2$$

$$= 14$$

$$f(x) = 3x + 2 \quad g(x) = x^2 - 2x + 4$$

$$(f \circ g)(x)$$

$$= 3(x^2 - 2x + 4) + 2$$

$$= 3x^2 - 6x + 12 + 2$$

$$= \underline{3x^2 - 6x + 14}$$

$$h(x) = \frac{3x^2 + 2}{x^2 - 1} \quad k(x) = \sqrt{2x + 1}$$

$$(h \circ k)(x)$$

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

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

$$= \frac{6x + 3 + 2}{2x}$$

$$= \frac{6x + 5}{2x}$$

$$= \frac{6x + 5}{2x}$$