Dividing Polynomials

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

$9 \overline{)389}$ $\quad 43\frac{2}{9}$

-36

29

-27

2

* Dividing Polyn.
* Function Ops

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

$x - 2 \overline{)2x^4 + 0x^3 - 6x^2 - x - 1}$

$-2x^4 + 4x^3$

$4x^3 - 6x^2$

$-4x^3 + 8x^2$

$2x^2 - x$

$-2x^2 + 4x$

$3x - 1$

$-3x + 6$

5

$x - 2$

1

change all signs

Synthetic Division – only works if dividing by x + # or x −

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

$+2$ | 2 0 −6 −1 −1

+ 4 8 4 6

2 4 2 3 5

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

Start by dropping the first number below the line

Function Operations

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

$f(-3) = (-3)^2 + 3(-3) + 2$

$9 + -6 + 2 = 5$

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

$= 4x^2 + 2x + 9$

$(f+g)(1) = 4(1)^2 + 2(1) + 9 =$

$4 + 2 + 9 = 15$

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

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

$= 3x^3 - 6x^2 + 12x + 2x^2 - 4x + 8$

$= 3x^3 - 4x^2 + 8x + 8$

$\left(\frac{K}{p}\right)(x) = \frac{3x+2}{\frac{1}{x-2}} = (3x+2) \cdot \frac{(x-2)}{1}$

$= 3x^2 - 6x + 2x - 4$

$= 3x^2 - 4x - 4$

Composition of Functions – Function in a function

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

$f[g(x)] = 3(x^2 - 2x + 4) + 2$

$f(4) = 3x^2 - 6x + 12 + 2$

$= 3x^2 - 6x + 4$

$f[g(2)]$ $g(2) = 2^2 - 2(2) + 4$

$= 4 - 4 + 4$

$= 4$

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

$= 14$

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

$p(x)=x-3$

$(g \circ f)(x)$

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

$(3x+2)(3x+2)$

$= 9x^2 + 6x + 6x + 4 - 6x - 4 + 4$

$= 9x^2 + 6x + 4$

December 15, 2025

$f(x)=3x+2$ $g(x)=x^2+2x+1$ $h(x)=\frac{3x^2+2}{x^2-1}$ $K(x)=\sqrt{2x+1}$ $p(x)=x-3$

$(g\circ f)(x)$

$(h\circ K\circ p)(x)$

$K\circ p=\sqrt{2(x-3)+1}$

$=\sqrt{2x-6+1}$

$=\sqrt{2x-5}$

$h\circ(K\circ p)$

$h\left(\sqrt{2x-5}\right)=\frac{3\left(\sqrt{2x-5}\right)^2+2}{\left(\sqrt{2x-5}\right)^2-1}$

$=\frac{3(2x-5)+2}{2x-5-1}$

$=\frac{6x-15+2}{2x-6}$

$=\frac{6x-13}{2x-6}$

December 15, 2025