December 16, 2024

DIVIDING POLYNOMIALS

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

$9\overline{)389}$

* Dividing Polyn.
* Function Ops

Synthetic Division

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

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

Start by dropping the first number below the line

Function Operations

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

$f(-3) = (-3)^2 + 3(-3) + 2$
$= 9 + -9 + 2 = 2$ $\quad (-3, 2)$

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

$(f+g)(1) = 4(1)^2 + 2(1) + 9$
$= 4 + 2 + 9 = 15$

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

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

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

COMPOSITION OF FUNCTIONS – Function in a function

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

$f[g(x)] =$

$f[g(2)]$

$$g(\overset{x}{2}) = 2^2 - 2(2) + 4$$
$$= \cancel{4} - \cancel{4} + 4$$
$$= 4 \quad y.$$
$$f(4) = 3(4) + 2 = 14$$

$f(x) = 3x + 2 \qquad g(x) = \boxed{x^2 - 2x + 4}$

$h(x) = \dfrac{3x^2 + 2}{x^2 - 1} \qquad K(x) = \sqrt{2x+1}$

$(f \circ g)(x)$

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

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

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

$(h \circ K)(x)$

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

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

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

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

Inverse Functions

$f(x) = 4x + 7$

$y = 4x + 7$

$x = 4y + 7$

$\frac{x-7}{4} = \frac{\cancel{4}y}{\cancel{4}}$

$\frac{x-7}{4} = f^{-1}$

If $f = \{(x, y)\}$, then

$f^{-1} = \{(y, x)\}$

$f = \{(2,3)\ (-4,7)\ (1,-5)\}$

$f^{-1} = \{(3,2)\ (7,-4)\ (-5,1)\}$

1) Switch the x's & y's
2) Solve for y.

Find f^{-1}

$\cancel{f(x)}\ y = 4x^2 + 9$

$x = 4y^2 + 9$

$\sqrt{\frac{x-9}{4}} = \sqrt{\frac{\cancel{4}y^2}{\cancel{4}}}$

$\pm\frac{\sqrt{x-9}}{2} = f^{-1} = g$

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

$4\left(\pm\frac{\sqrt{x-9}}{2}\right)^2 + 9$

$\cancel{4}\left(\frac{x-9}{\cancel{4}}\right) + 9$

$x - \cancel{9} + \cancel{9}$

$= x$

If $f \circ g = x$ OR $g \circ f = x$

then f & g are inverses of each other.