September 21, 2016

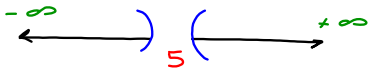
#1) $g(x) = \frac{x+3}{x-5}$ ← rule

↑ input

$x - 5 = 0$

$x = 5$

So, $x \neq 5$ in the function



$D: (-\infty, 5) \cup (5, \infty)$

↑ union

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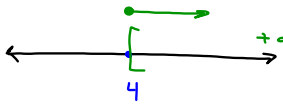
#2) $f(x) = \sqrt{x-4}$

$x - 4 \geq 0$

$x \geq 4$



$D: [4, \infty)$

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#3) $h(t) = t^2 - 3t - 10$

$D: (-\infty, \infty)$

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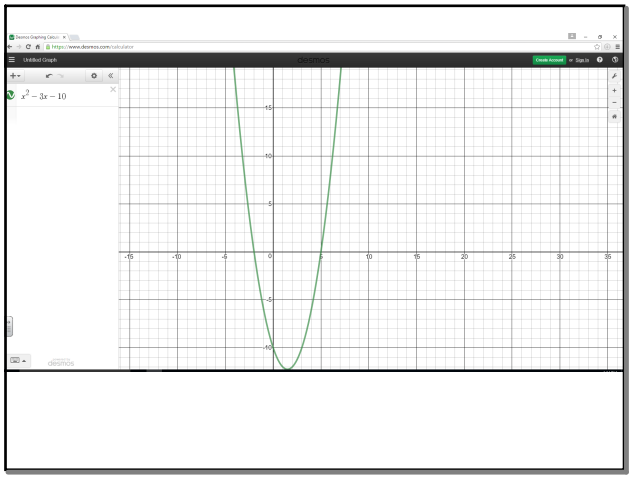

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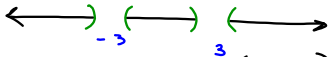
#4) $s(x) = \frac{x}{x^2 - 9}$

$x^2 - 9 = 0$

$\sqrt{x^2} = \pm\sqrt{9}$

$x = \pm 3$

So, $x \neq \pm 3$ in "s"



$D: (-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

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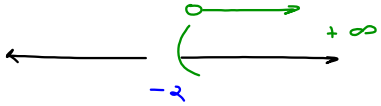
#5) $f(x) = \frac{\sqrt{x+2} \geq 0 \quad x \geq -2}{x + 2 = 0}$

$x = -2$

So

① $x \geq -2$

② $x \neq -2$ } ?



$D: (-2, \infty)$

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Algebra of Functions

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

① Addition

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

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② $(f-g)(x) = f(x) - g(x)$

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

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③ multiplication

$$(fg)(x) = f(x) \cdot g(x)$$
$$= (x^2 + x)(3x - 2)$$
$$= 3x^3 - 2x^2 + 3x^2 - 2x$$
$$= 3x^3 + x^2 - 2x$$

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④ Division

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}; \quad g(x) \neq 0$$
$$= \frac{x^2 + x}{3x - 2}$$

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⑤ Composition

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

"f" composed of "g"

$$= f(3x - 2)$$
$$= (3x-2)^2 + (3x-2)$$
$$= (3x-2)(3x-2) + 3x - 2$$
$$= 9x^2 - 12x + 4 + 3x - 2$$
$$= 9x^2 - 9x + 2$$

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

$$(f \circ f)(x) = f(f(x))$$
$$= (f(x))^2 + (f(x))$$
$$= (x^2 + x)^2 + (x^2 + x)$$
$$= (x^2 + x)(x^2 + x) + x^2 + x$$
$$= x^4 + 2x^3 + x^2 + x^3 + x^2 + x^2 + x$$
$$= x^4 + 3x^3 + 2x^2 + x$$

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