Sunday, October 14, 2018
5:23 PM

Precalculus 1.4B Functions

Obj: To apply function notation; evaluate & find domains of functions, and evaluate difference quotients.

Hwk: 1.4B # 43, 49, 53, 57, 59, 61

Do Now:

Evaluate the functions with the given values:

$f(x) = x + 7$ $\quad g(x) = x^2 - x + 2$ $\quad k(x) = \frac{3}{4}x - 1$

a) $k(8)$

$\frac{3}{\cancel{4}}(\overset{2}{\cancel{8}}) - 1 = \boxed{5}$

b) $g(1)$

$(1)^2 - 1 + 2$

$= \boxed{2}$

c) $f(-5)$

$= -5 + 7$

$= \boxed{2}$

d) $g(p - 3)$

$(p-3)^2 - (p-3) + 2$

$= (p-3)(p-3) - p + 3 + 2$

$= p^2 - 6p + 9 - p + 5$

$= \boxed{p^2 - 7p + 14}$

Recap:

function notation:

"name" of function

- $f(x) = y$. $g(x)$, $h(x)$, $k(x)$ are all dif. functions
- x = *input* – the value/expression being evaluated
- y = *output* – the result of the function
- $f(2)$ means "find the value of y if $x = 2$"

piecewise function: combines more than 1 equation over dif. parts of the domain.

Ex: if $f(x) = \begin{cases} 3x - 4 & \text{if } x < -4 \\ 3.5 & \text{if } -4 \le x \le -2 \\ 3x + 1 & \text{if } x > -2 \end{cases}$ find:

a) $f(-3)$

$= \boxed{3.5}$

b) $f(1)$

$= 3(1) + 1$

$= \boxed{4}$

c) $f(-5)$

$= 3(-5) - 4$

$= -15 - 4 = \boxed{-19}$

If domain isn't stated, it is *IMPLIED* – the set of all real numbers for which the expression is defined.

- Polynomial: all real numbers **$(-\infty, \infty)$** or $\mathbb{R}$
- Rational: (fraction): denom. $\neq$ zero
- Radical: (EVEN roots): radicand is not NEGATIVE **(≥ 0)**
- Rational functions with radical denominators: radicand must be POSITIVE **(>0)**

Find the domain of each. Use interval notation when possible.

Ex. 1) f:{(-3,0), (-1, 4), (0, 2), (2, 2), (4, -1)}

D: $\{-3, -1, 0, 2, 4\}$

Ex. 2) $g(x) = \dfrac{1}{x^2 - 4}$ ← can't $= 0$

$x^2 - 4 = 0$

$(x+2)(x-2) = 0 \quad x \neq -2 \quad x \neq 2$

$\boxed{(-\infty, -2) \cup (-2, 2) \cup (2, \infty)}$

Ex. 3) $f(x) = \sqrt{3-x}$ ← must be positive

$3 - x \geq 0$

$-x \geq -3$

$x \leq 3$

$\boxed{(-\infty, 3]}$

Ex. 4) $g(x) = \dfrac{\sqrt{x+5}}{x^2 - 9}$ ← must be pos ← can't $= 0$

$x + 5 \geq 0$

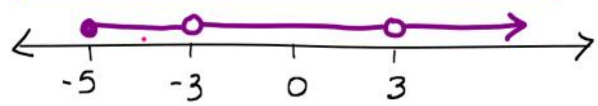
$x \geq -5$

$x^2 - 9 = 0$

$(x+3)(x-3) = 0$

$x \neq -3 \quad x \neq 3$

$\boxed{[-5, -3) \cup (-3, 3) \cup (3, \infty)}$



Other types of problems:

Ex. 5) Find all real values of x such that f(x) = 0:

$f(x) = x^2 - 8x + 15$ *Another name for f(x) = 0? Solve!

$x^2 - 8x + 15 = 0$

$(x-5)(x-3) = 0 \quad \boxed{x = 5} \quad \boxed{x = 3}$

Ex. 6) Find the values of x for which f(x) = g(x):

$f(x) = x^4 - 2x^2$ GCF! $g(x) = 2x^2$

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

$x^4 - 4x^2 = 0$

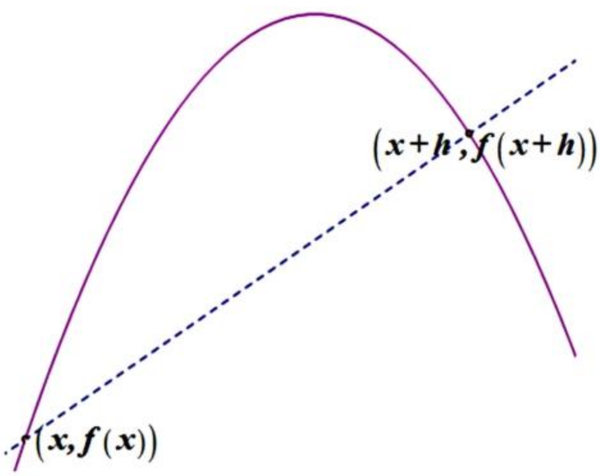
$x^2(x^2 - 4) = 0$

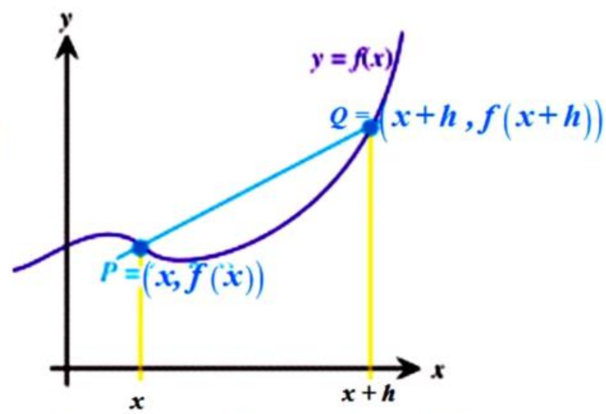
$x^2(x+2)(x-2) = 0$

$\boxed{x = 0 \quad x = -2 \quad x = 2}$

Difference Quotient: $\frac{f(x+h)-f(x)}{h}, h \neq 0$

*this is used in calculus! It finds the slope of the secant line joining the points (x, f(x)) and (x + h, f(x + h)) on the graph of function f; aka "average rate of change" between the 2 pts





Average rate of change = slope of $\overline{PQ}$

Slope = $\frac{y_2 - y_1}{x_2 - x_1}$

Ex. 7) Find the difference quotient: $\frac{f(x+h)-f(x)}{h}, h \neq 0$ WHY?

If $f(x) = x^2 - 2x + 9$, find $\frac{f(4+h)-f(4)}{h}, h \neq 0$

$$\begin{aligned} f(4+h) &= (4+h)^2 - 2(4+h) + 9 \\ &= (4+h)(4+h) - 8 - 2h + 9 \\ &= 16 + 8h + h^2 - 2h + 1 \\ &= h^2 + 6h + 17 \end{aligned}$$

$$\begin{aligned} f(4) &= (4)^2 - 2(4) + 9 \\ &= 16 - 8 + 9 \\ &= 17 \end{aligned}$$

Dif. Quotient: $\frac{h^2+6h+17-17}{h} = \frac{h^2+6h}{h} = \frac{\cancel{h}(h+6)}{\cancel{h}} = \boxed{h+6 \quad h \neq 0}$

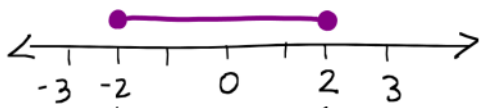
If time, CHALLENGE: Give the implied domain

$h(x) = \sqrt{4 - x^2}$ ← must be pos.

$4 - x^2 \geq 0$

$(2+x)(2-x) = 0$

$x = -2 \quad x = 2$



$\boxed{[-2, 2]}$

F	$4-(0)^2 \geq 0$ $4 \geq 0$ T	$4-(3)^2 \geq 0$ $-5 \geq 0$ F