PRE-CALC & TRIG

Day 68

For Next Time

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6.6 Function Operations

Objective: To add, subtract, multiply, and divide functions
To find the composite of two functions

Operations on Functions;

Let f and g be any two functions.

Operation	Definition	Examples: f(x) = 2x; g(x) = x + 1
Addition	$(f+g)(x) = f(x) + g(x)$	h(x) = 2x + (x + 1) = 3x + 1
Subtraction	$(f-g)(x) = f(x) - g(x)$	h(x) = 2x – (x + 1) = x – 1
Multiplication	$(f \times g)(x) = f(x) \times g(x)$	h(x) = (2x)(x + 1) = $2x^2 + 2x$
Division	$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$; g(x) $\neq 0$	**h(x)** = 2x/(x+1)

Domain

Domain of h = the x-values that are in the domains of **both** f and g

The domain of a quotient does not include x-values for which the denominator = 0

Example

Perform each indicated operation, and state the domain.

$f(x) + g(x)$; where
$f(x) = 3x^3 – 2x^2 + 5x - 1$ and $g(x) = x^2 + 7x - 1$

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$f(x) + g(x)$;
$(3x^3 – 2x^2 + 5x – 1) + (x^2 + 7x – 1) =$ **$3x^3 – 2x^2 + 12x – 2$**

Domain is all real numbers

Composition of Two Functions;

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

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Note: For f(g(x)): substitute g(x) for x in the function f(x)…

In general, f(g(x)) ≠ g(f(x)) (although it is possible, this would just be a coincidence)

Example:

Let $f(x) = 4x$ and $g(x) = x - 1$. Perform the indicated operation and state the domain.

a) $f(g(x))$

b) $g(f(x))$

c) $f(f(x))$

d) $g(g(x))$

Example:

Let $f(x) = 4x$ and $g(x) = x - 1$. Perform the indicated operation and state the domain.

a) $f(g(x))$

plug the g into f

$4(x-1)=\mathbf{4x-4}$

b) $g(f(x))$

plug the f into g

$(4x)-1=\mathbf{4x-1}$

c) $f(f(x))$

plug the f into f

$4(4x)=\mathbf{16x}$

d) $g(g(x))$

plug the g into g

$(x-1)-1 = \mathbf{x-2}$

6.7 Inverse Relations and Functions

Objective: To find the inverse of a relation or function

Inverse Relation: maps the output values back to the original input values (x's and y's switch)

The domain of the inverse relation is the range of the original relation, and the range of the inverse relation is the domain of the original relation

Inverse Functions: when the inverse and original relations are both functions, then they are inverse functions of each other

Finding the Inverse Relation;

1) Switch x and y in the original relation
2) Solve for y (if possible)

Find an equation for the inverse of the given relation:

$y = 2x - 4$

Find an equation for the inverse of the given relation:

$y = 2x - 4$

$x = 2y - 4$

$x + 4 = 2y$

$\mathbf{(x + 4)/2 = y}$

Inverse Functions;

Functions f and g are inverses of each other provided:

$f(g(x)) = x$ and $g(f(x)) = x$

The function g is denoted by f^{-1}, read as "f inverse"

Verify that f and g are inverse functions:

f(x) = x + 7 and g(x) = x – 7

f(x) = 2x – 4 and $g(x) = \frac{1}{2}x + 2$

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