A. Gerolin made by

2. Function Review

Lec 1 mini review.

functions:	independent variable, dependent variable, domain, range		
graphs:	vertical line test, symmetry (even/odd), periodicity, transformations intervals of increase/decrease		
linear functions:	slope, intercepts		
polynomials:	any degree $n \geq 0$ (constant, linear, quadratic, cubic,...), coefficients		
power functions:	$f(x) = x^n$	**root functions**:	$f(x) = x^{1/n} = \sqrt[n]{x}$
rational functions	**algebraic functions**	**absolute value**:	$f(x) = \lvert x \rvert$

COMPOSITION

Let f and g be functions. If all numbers in the range of g are in the domain of f, then the **COMPOSITION** $f \circ g$ is a function defined by

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Example 2.1. Find the composition $f \circ g$, where $f(x) = \dfrac{x-1}{x+1}$ and $g(x) = \dfrac{1}{\sqrt{x}}$

INVERSE

Horizontal Line Test: Let $y = f(x)$ be a function. If every horizontal line crosses the graph of f at most once, then $f(x)$ is a **ONE-TO-ONE (INJECTIVE)** function.

Inverse: Let $y = f(x)$ be a function. If f passes the Horizontal Line Test, then the map f^{-1} defined by the rule

is a function called the **INVERSE** of f.

Composition of a function with its inverse:

Example 2.2. Find the inverse of $g(x) = \dfrac{2x-1}{3x+2}$ and verify that $(g \circ g^{-1})(x) = x = (g^{-1} \circ g)(x)$.

1. Write $y = g(x)$:

2. Interchange x's and y's:

3. Isolate 'new' y:

Exercise 2.3. Use the table to evaluate each of the following expressions.

x	1	2	3	4	5	6
$f(x)$	3	1	4	2	6	5
$g(x)$	5	3	2	6	2	3

a. $f^{-1}(1)$ **b.** $(g \circ f)(3)$ **c.** $(f \circ g)(6)$

d. $(f \circ f^{-1})(4)$ **e.** $g(g(1))$ **f.** $(g \circ f)(1)$

g. $(f^{-1} \circ f^{-1})(4)$ **h.** $(f^{-1} \circ f)(6)$ **i.** $(g \circ f^{-1})(1)$

Example 2.4. Find the inverse of $f(x) = \sqrt{x-2}$ and sketch the graphs of f and f^{-1}.

CATALOGUE OF IMPORTANT FUNCTIONS: EXPONENTIAL & LOGARITHMIC

Exponential Functions:

Natural Base:

Laws of Exponents:

Example 2.5. Solve for x in the equation $2^{x+3} = 16^{2x-1}$.

Logarithmic Functions:

Natural Logarithm:

Laws of Logs:

Inverse Relationship between a^x and $\log_a(x)$:

Example 2.6. Solve for x in the equation $\log(x+1) + \log(x+4) = 1$.

Example 2.7. A bacterial population grows according to the model $b(t) = 1.8^t b_0$ where t represents time in hours, $b(t)$ represents the number of bacteria in the population at time t, and b_0 represents the initial population at time $t = 0$ (assume $b_0 > 0$).

How long will it take for the initial population to triple in size?

CATALOGUE OF IMPORTANT FUNCTIONS: TRIGONOMETRIC & INVERSE TRIG

Trigonometric Ratios:

Basic Trigonometric Functions

sine:

cosine:

tangent:

Reciprocal Trig Functions

cosecant:

secant:

cotangent:

Useful Trig Identities

Inverse Trig Functions

arcsine:

arccosine:

arctangent:

Example 2.8. Find the domain of $g(x) = \dfrac{\cos(x)}{\frac{1}{2} - \sin(x)}$.