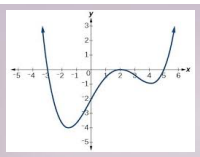
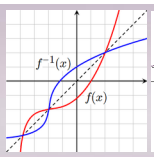

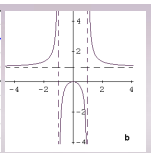
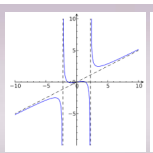
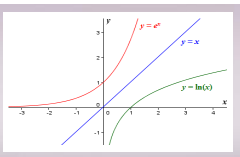

Math 1050 ~ College Algebra

$$-3x + 4y = 5$$
$$2x - y = -10$$
$$\begin{bmatrix} -3 & 4 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ -10 \end{bmatrix}$$

$$\sum_{k=1}^{m} k = \frac{m(m+1)}{2}$$
$$\sum_{k=0}^{n} z^k = \frac{1 - z^{n+1}}{1 - z}$$

4 Combinations of Functions

Learning Objectives

- Find and simplify functions involving arithmetic expressions.
- Combine functions through addition, subtraction, multiplication and
- division.
- Determine the domain of a function resulting from an arithmetic operation.
- Find the difference quotient of a function.
- Create a new function through composition of functions.
- Find the domain of a composite function.
- Find values of composite functions.
- Decompose a composite function into its component functions.

Ex 1: Evaluate this function at the given expressions, simplifying your answer.

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

a) $f(-3)$ b) $f(x-2)$ c) $f(x^{-2})$ d) $f(x^2+1)$

It is also possible to perform arithmetic operations on functions.

Sum

Difference

Product

Quotient

Composition

Ex 2: For $f(x)=\sqrt{x-1}$, and $g(x)=\frac{x}{x^2-4}$, simplify the resulting function and determine the domain.

a) $(f+g)(x)$ b) $(f-g)(5)$ c) $\left(\frac{f}{g}\right)(x)$

Ex 3: For the two functions above, find

a) $f(g(x))$ (include domain) b) $g(f(x))$ (include domain)

Ex 4: For $f(x) = 3x + 5$, find $(f \circ f)(x)$ and its domain.

In calculus, one frequently is required to find a difference quotient, $\frac{f(x+h)-f(x)}{h}$.

Ex 5: Find the difference quotient for each of these.

a) $f(x) = 3x + 5$ b) $f(x) = x^2 - 3x + 1$

Decomposing Functions

Ex 6: Find two functions f and g such that $f(g(x)) = h(x)$ where $h(x) = \frac{3}{(5x+1)^2}$.