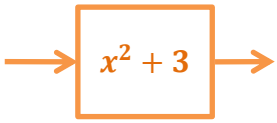
Functions

(covers parts of Sullivan 2.1 and 2.4)

Ex 1.



Ex 2.
Suppose $f(x) = x^2 + 3$. Find $f(2)$.

Ex 3.
Suppose $f(x) = \frac{x+12}{9-x}$. Find $f(10)$.

Ex 4.
Suppose $f(x) = \frac{x^3+\sqrt{x}}{2x-1}$. Find $f($  $)$.

Ex 5.
Suppose $f(x) = 2x^2 - 3x$. Find $\frac{f(x+h)-f(x)}{h}$ (called the **difference quotient**) and simplify by canceling the factor of h.

Ex 6.

Suppose $f(x) = \frac{3}{x}$. Find $\frac{f(x+h)-f(x)}{h}$ and simplify by canceling the factor of h.

Ex 7.

Suppose $f(x) = \sqrt{x-5}$. Find $\frac{f(x+h)-f(x)}{h}$ and simplify by canceling the factor of h.

Sometimes functions have different formulas depending on your input.
These are called **piecewise-defined functions**.

Ex 8.
Evaluate the piecewise-defined function at the indicated values.

$$f(x) = \begin{cases} 2 - x^2 & \text{if } x < -1 \\ 3x - 3 & \text{if } -1 < x \leq 4 \\ -2 & \text{if } x > 4 \end{cases}$$

$f(-2) =$

$f(-1)$

$f(0) =$

$f(4) =$

$f(5) =$

$f(999999999999999999999999999999999999) =$

The _____ of a function is the set of all possible _____.

The _____ of a function is the set of all possible _____.

$\frac{}{\square} \rightarrow \square \neq 0$ $\qquad$ $\sqrt{\square} \rightarrow \square \geq 0$ $\qquad$ $\log \square \rightarrow \square > 0$

Ex 9.
Find the domain of each of the following functions.

$f(x) = \frac{x+2}{x^2-9}$

$g(x) = \sqrt{2x - 8}$

$h(x) = \frac{x-2}{\sqrt{5-3x}}$

$p(x) = -3x^2 + 5x - 6$

Suppose you have two functions, $f(x)$ and $g(x)$.
You can add, subtract, multiply, and divide f and g to get new functions:

$(f+g)(x) = f(x) + g(x)$
$(f-g)(x) = f(x) - g(x)$
$(fg)(x) = f(x)g(x)$
$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$

ex: Suppose $f(x) = \frac{1}{x-2}$ and $g(x) = \sqrt{x}$. Then…

$(f+g)(x) = \frac{1}{x-2} + \sqrt{x}$ and $\left(\frac{f}{g}\right)(x) = \frac{\left(\frac{1}{x-2}\right)}{\sqrt{x}} = \frac{1}{(x-2)\sqrt{x}}$

The domains of $f+g$, $f-g$, and fg are all the numbers that can be plugged into **both** $f(x)$ and $g(x)$ (that is, it's the intersection of the domains of f and g). For f/g it's the same, though you also have to take out any numbers that make $g(x) = 0$.