Chapter 3.1 Notes
Functions

* Relation = a correspondence between 2 sets. (x corresponds to y)

* Domain = set of all inputs for a relation. (The 1st number in an ordered pair.)

* Range = set of all inputs. (The 2nd number in an ordered pair.)

* Function = every element in the domain can corresponds to only 1 element in the range. (The x's can not repeat)

* (f + g) (x) = f(x) + g(x)

* (f - g) (x) = f(x) - g(x)

* (f • g) (x) = f(x)   g(x)

* $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$

1. Find the domain of the function. $g(x) = \frac{6x}{x^2 - 1}$

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$x^2 - \cancel{1} \neq 0$

$\quad\;\; \cancel{+1} \quad +1$

$x^2 \neq 1$

$\sqrt{x^2} \neq \sqrt{1}$

$x \neq -1, 1$

$\boxed{(-\infty, -1) \cup (-1, 1) \cup (1, \infty)}$

* When finding the domain of a fraction, just look at the denominator.

* The denominator can not equal 0.

* Write down the denominator " ≠ 0 ".

* Then solve for x.

* So this tells us that "x" can be any number but the these numbers.

* Write the domain using interval notation with "U" between them.

2. Find the domain of the function. $F(x) = \dfrac{5x(x-6)}{3x^2-20x-7}$

$$F(x) = \frac{5x(x-6)}{3x^2-20x-7}$$

$$3x^2 - 20x - 7 \neq 0$$

$a=3$ $b=-20$ $c=-7$

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$ Quadratic formula

$$\frac{-(-20) \pm \sqrt{(-20)^2-4(3)(-7)}}{2(3)}$$

$$\boxed{x \neq -\frac{1}{3}, 7} \quad \text{-or-} \quad \boxed{x \neq -\frac{1}{3}, \; x \neq 7}$$

* When finding the domain of a fraction, just look at the denominator.
* The denominator can not equal 0.
* Write down the denominator " $\neq 0$ ".
* Then solve for x by using the quadratic formula.
* So this tells us that "x" can be any number but the these numbers.

3. Find the domain of the function. $f(x) = \sqrt{4x-24}$

$$f(x) = \sqrt{4x-24}$$

$$4x - 24 \geq 0$$

$$+24 \quad +24$$

$$\frac{4x}{4} \geq \frac{24}{4}$$

$$x \geq 6$$

$$\boxed{[6, \infty)}$$

* When finding the domain of a square root, it will have to be greater than or equal to 0. (Because we can not have a negative under a square root.)
* Write down what's under the square root sign " ≥ 0 "
* Then solve for x.
* So this tells us that "x" will be greater than or equal to this number.
* Write the domain using interval notation.

4. Find the domain of the function. $f(x) = \dfrac{2x}{\sqrt{x-5}}$

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

$$\sqrt{x-5} \neq 0$$

$$\begin{array}{rcl} x-5 & > & 0 \\ +5 & & +5 \\ \hline x & > & 5 \end{array}$$

$$\boxed{(5, \infty)}$$

* When finding the domain of a fraction, just look at the denominator.
* The denominator can not equal 0.
* Write down the denominator " ≠ 0 ".
* Now, since we have a square root, we will write down what's under the square root sign and then "> 0"
*
* So, this tells us that "x" will be greater than or equal to this number.
* Write the domain using interval notation.

5. State the domain and range for the following relation. Then determine whether the relation represents a function,

$\{(6,2), (-1,2), (9,6), (6,11)\}$

D R D R D R D R

Domain = $\boxed{6, -1, 9, 6}$

Range = $\boxed{2, 2, 6, 11}$

* Label the first number in each ordered pair "D" and the second number in each pair "R".
* Now the domain will be each number that you labeled with a "d". (If a number repeats, only write it down once,
* The range will be each number that is labeled with and "R". (If a number repeats, only write it down once.)
* If a number repeats in the domain, then it is not a function.

* Not a function, because there are 2 of the same number in the domain.

The relation is not a function because there are ordered pairs with 6 as the first element and different second elements.

6. State the domain and range for the following relation. Then determine whether the relation represents a function,

$\{(7,-3),\ (8,-3),\ (9,-3),\ (10,-3)\}$

D R D R D R D R

* Label the first number in each ordered pair “D” and the second number in each pair “R”.
* Now the domain will be each number that you labeled with a “d”. (If a number repeats, only write it down once,
* The range will be each number that is labeled with and “R”. (If a number repeats, only write it down once.)
* If a number repeats in the domain, then it is not a function.

Domain = $\boxed{7, 8, 9, 10}$

Range = $\boxed{-3}$

* It's a function, because no numbers repeat in the Domain.

The relation is a function because there are no ordered pairs with the same first element + different second elements.

7. For the given functions f and g, complete parts (a)-(h). For parts (a)-(d), also find the domain.

$f(x) = 5x+6 \qquad g(x) = 9x-2$

a) Find $(f+g)(x)$.

$5x+6+9x-2$

$\boxed{14x+4}$

The domain is $\{x \mid x \text{ is any real number.}\}$

b) Find $(f-g)(x)$

$5x+6-(9x-2)$

$5x+6-9x+2$

$\boxed{-4x+8}$

$\boxed{\text{The domain is } \{x \mid x \text{ is any real number.}\}}$

c) Find $(f \cdot g)(x)$

$(5x+6)(9x-2)$

$45x^2-10x+54x-12$

$\boxed{45x^2+44x-12}$

$\boxed{\text{The domain is } \{x \mid x \text{ is any real number.}\}}$

d) Find $\left(\frac{f}{g}\right)(x)$

$\boxed{\dfrac{5x+6}{9x-2}}$

For Domain:

$9x-2 \neq 0$

$+2 \quad +2$

$\frac{9x}{9} \neq \frac{2}{9}$

$= \boxed{x \neq \frac{2}{9}}$ ← Domain

$f(x) = 5x+6$ $\qquad$ $g(x) = 9x-2$

e.) Find $(f+g)(3)$

$5x+6+9x-2$

$5(3)+6+9(3)-2$ Type into calculator

$= \boxed{46}$

* Once you write down the problem, replace each "x" with the number in ( ). Then type into calculator.

f.) Find $(f-g)(2)$

$5x+6-(9x-2)$

$5(2)+6-(9(2)-2)$ Type into calculator

$= \boxed{0}$

g.) Find $(f \cdot g)(4)$

$(5x+6)(9x-2)$

$(5(4)+6)(9(4)-2)$ Type into calculator

$= \boxed{884}$

h.) Find $\left(\frac{f}{g}\right)(1)$

$$\frac{5x+6}{9x-2}$$

Type into calculator.

$$\frac{5(1)+6}{9(1)-2} = \boxed{\frac{11}{7}}$$

8. For the given functions f and g, complete parts (a)-(h). For parts (a)-(d), also find the domain.

$f(x) = x - 5$ $\quad$ $g(x) = 8x^2$

a.) Find $(f+g)(x)$

$\boxed{x - 5 + 8x^2}$

The domain is $\{x \mid x$ is any real number.$\}$

b.) Find $(f-g)(x)$

$\boxed{x - 5 - 8x^2}$

The domain is $\{x \mid x$ is any real number.$\}$

c.) Find $(f \cdot g)(x)$

$(x-5)(8x^2)$

$\boxed{8x^3 - 40x^2}$

The domain is $\{x \mid x$ is any real number.$\}$

d.) Find $\left(\frac{f}{g}\right)(x)$

$\boxed{\frac{x-5}{8x^2}}$

For domain:

$\frac{8x^2}{8} \neq \frac{0}{8}$

$x^2 \neq 0$

$\sqrt{x^2} \neq 0 \rightarrow \boxed{x \neq 0}$

$f(x) = x - 5$ $\qquad g(x) = 8x^2$

e.) Find $(f+g)(4)$

$x - 5 + 8x^2$

$4 - 5 + 8(4)^2 = \boxed{127}$

* Once you write down the problem, replace each "x" with the number in ( ). Then type into Calculator.

f.) Find $(f-g)(3)$

$x - 5 - 8x^2$

$3 - 5 - 8(3)^2 = \boxed{-74}$

g.) Find $(f \cdot g)(2)$

$(x-5)(8x^2)$

$(2-5)(8(2)^2) = \boxed{-96}$

h.) Find $\left(\frac{f}{g}\right)(2)$

$\frac{x-5}{8x^2}$

$\frac{2-5}{8(2)^2} = \boxed{-\frac{3}{32}}$