Student: _____ Instructor: Andreas Lazari
Date: _____ Course: Math1111-Summer2018
Assignment: Section 2.6 Homework

1. Find the domain of the function.

$f(x) = x^2 - 13x + 15$

What is the domain of f?

- A. $(-\infty, -15) \cup (-15, \infty)$
- B. $(-\infty, 0) \cup (0, \infty)$
- C. $(-\infty, -15) \cup (-15, 0) \cup (0, \infty)$
- D. $(-\infty, \infty)$

2. Find the domain of the function.

$f(x) = \dfrac{14}{x^2 + 16x + 63}$

$x^2+16x+63=0 \Rightarrow (x+7)(x+9)=0$
$\Rightarrow x=-7$
$x=-9$

D: $x \neq -7, -9$

What is the domain of f?

$(-\infty,-9) \cup (-9,-7) \cup (-7,\infty)$ (Type your answer in interval notation.)

3. Find the domain of the function.

$g(x) = \sqrt{3x + 42}$

$3x+42 \geq 0 \Rightarrow 3x \geq -42$
$\Rightarrow x \geq \frac{-42}{3} = -14$

D: $x \geq -14$

What is the domain of g?

$[-14, \infty)$ (Type your answer in interval notation.)

4. Find the domain of the function.

$f(x) = \sqrt{10 - 2x}$

$10-2x \geq 0 \Rightarrow 2x \leq 10$
$\Rightarrow x \leq 5$

What is the domain of f?

$(-\infty, 5]$ (Type your answer in interval notation.)

5. First find $f+g$, $f-g$, fg and $\frac{f}{g}$. Then determine the domain for each function.

$f(x) = 6x + 6$, $g(x) = x + 8$

$(f+g)(x) =$ $(-\infty, \infty)$ (Simplify your answer.)

$f(f+g) = 6x+6+x+8 = 7x+14$

What is the domain of $f+g$?

- (●) $(-\infty,\infty)$
- ( ) $(-\infty,-2)\cup(-2,\infty)$
- ( ) $(-2,\infty)$
- ( ) $[0,\infty)$

$(f-g)(x) =$ $5x-2$ (Simplify your answer.)

$f(f-g) = 6x+6-(x+8)$
$= 6x+6-x-8 = 5x-2$

What is the domain of $f-g$?

- ( ) $[0,\infty)$
- ( ) $\left(\frac{2}{5},\infty\right)$
- (●) $(-\infty,\infty)$
- ( ) $\left(-\infty,\frac{2}{5}\right)\cup\left(\frac{2}{5},\infty\right)$

$(fg)(x) =$ $6x^2+54x+48$

$f(f\cdot g) = (6x+6)(x+8) = 6x^2+48x+6x+48$
$= 6x^2+54x+48$

What is the domain of fg?

- ( ) $(-\infty,-8)\cup(-8,\infty)$
- (●) $(-\infty,\infty)$
- ( ) $[0,\infty)$
- ( ) $(-\infty,-1)\cup(-1,\infty)$

$\left(\frac{f}{g}\right)(x) = \frac{6x+6}{x+8}$

$f\left(\frac{f}{g}\right) = \frac{6x+6}{x+8}$

What is the domain of $\frac{f}{g}$?

$x+8=0 \Rightarrow x=-8$

$D: x \neq -8$

- ( ) $(-\infty,\infty)$
- ( ) $[0,\infty)$
- ( ) $(-8,\infty)$
- (●) $(-\infty,-8)\cup(-8,\infty)$

$(-\infty,-8)\cup(-8,\infty)$

6. First find $f+g$, $f-g$, fg and $\frac{f}{g}$. Then determine the domain for each function.

$f(x) = 4x^2 - 26x - 48$, $g(x) = x - 8$

$(f+g)(x) = 4x^2 - 25x - 56$ (Simplify your answer.)

$f(f+g) = 4x^2 - 26x - 48 + x - 8$

$4x^2 - 25x - 56$.

What is the domain of $f+g$?

- ○ $\left(-\infty, -\frac{56}{25}\right) \cup \left(-\frac{56}{25}, \infty\right)$
- ● $(-\infty, \infty)$
- ○ $\left(-\frac{56}{25}, \infty\right)$
- ○ $[0, \infty)$

$(f-g)(x) = 4x^2 - 27x - 40$ (Simplify your answer.)

$f(f-g) = 4x^2 - 26x - 48 - (x-8)$

$= 4x^2 - 26x - 48 - x + 8$

$= 4x^2 - 27x - 40$

What is the domain of $f-g$?

- ○ $[0, \infty)$
- ○ $\left(-\frac{56}{25}, \infty\right)$
- ○ $\left(-\infty, -\frac{24}{13}\right) \cup \left(-\frac{24}{13}, \infty\right)$
- ● $(-\infty, \infty)$

$(fg)(x) = 4x^3 - 58x^2 + 160x + 384$

$f(f \cdot g) = (4x^2 - 26x - 48)(x - 8)$

$= 4x^3 - 32x^2 - 26x^2 + 208x - 48x + 384$.

$= 4x^3 - 58x^2 + 160x + 384$

What is the domain of fg?

- ● $(-\infty, \infty)$
- ○ $(-\infty, 8) \cup (8, \infty)$
- ○ $\left(-\frac{40}{27}, \infty\right)$
- ○ $\left(-\infty, -\frac{40}{27}\right) \cup \left(-\frac{40}{27}, \infty\right)$

$\left(\frac{f}{g}\right)(x) = 4x + 6$ (Simplify your answer.)

$f\left(\frac{f}{g}\right) = \frac{4x^2 - 26x - 48}{x - 8} = \frac{(4x+6)(x-8)}{x-8}$

$= 4x + 6$

What is the domain of $\frac{f}{g}$?

- ○ $[0, \infty)$
- ● $(-\infty, 8) \cup (8, \infty)$
- ○ $(-\infty, \infty)$
- ○ $(8, \infty)$

$x - 8 = 0$

$x = 8$

D: $x \neq 8$

$(-\infty, 8) \cup (8, \infty)$.

7. First find $f+g$, $f-g$, fg, and $\frac{f}{g}$. Then determine the domain for each function.

$f(x) = \sqrt{x+5}$; $g(x) = \sqrt{x+1}$

$(f+g)(x) = \sqrt{x+5} + \sqrt{x+1}$

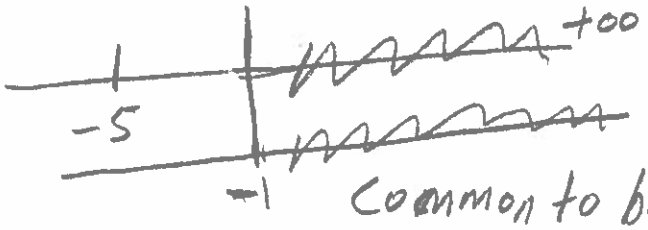
$f(f+g) = \sqrt{x+5} + \sqrt{x+1}$

What is the domain of $f+g$?

- [●] $[-1, \infty)$
- [ ] $[0, \infty)$
- [ ] $[-5, \infty)$
- [ ] $(-\infty, \infty)$

$f(x) = \sqrt{x+5} \Rightarrow x \geq -5$

$g(x) = \sqrt{x+1} \Rightarrow x \geq -1$



Common to both

$(f-g)(x) =$ _____

What is the domain of $f-g$?

- [ ] $[0, \infty)$
- [ ] $[-5, \infty)$
- [ ] $(-\infty, \infty)$
- [ ] $[-1, \infty)$

$f(f-g) = \sqrt{x+5} - \sqrt{x+1}$

Domain; $[-1, \infty)$

$(fg)(x) =$ _____ (Simplify your answer.)

What is the domain of fg?

- [ ] $(-\infty, \infty)$
- [ ] $[-5, \infty)$
- [●] $[-1, \infty)$
- [ ] $[0, \infty)$

Domain the same as $[-1, \infty)$

$\left(\frac{f}{g}\right)(x) =$ _____ (Simplify your answer.)

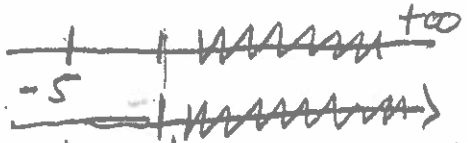
$f\left(\frac{f}{g}\right) = \frac{\sqrt{x+5}}{\sqrt{x+1}}$

What is the domain of $\frac{f}{g}$?

$= \frac{\sqrt{x+5} \cdot \sqrt{x+1}}{\sqrt{x+1} \cdot \sqrt{x+1}} = \frac{\sqrt{(x+5)(x+1)}}{x+1} = \frac{\sqrt{x^2+6x+5}}{x+1}$

- [ ] $[0, -1) \cup (-1, \infty)$
- [●] $(-1, \infty)$
- [ ] $(-\infty, -1) \cup (-1, \infty)$
- [ ] $[-1, \infty)$

D: $x \neq -1$



-1 is not included

D: $(-1, \infty)$

8. For $f(x) = x + 2$ and $g(x) = 3x + 1$, find the following functions.

a. $(f \circ g)(x)$; **b.** $(g \circ f)(x)$; **c.** $(f \circ g)(2)$; **d.** $(g \circ f)(2)$

a. $(f \circ g)(x) =$ $3x+3$ (Simplify your answer.) $fog = 3x+1+2 = 3x+3$

b. $(g \circ f)(x) =$ $3x+7$ (Simplify your answer.) $gof = 3(x+2)+1 = 3x+6+1 = 3x+7$

c. $(f \circ g)(2) =$ 9 $fog(2) = 3(2)+3 = 9$

d. $(g \circ f)(2) =$ 13 $gof(2) = 3(2)+7 = 13$

9. For $f(x) = 5x - 4$ and $g(x) = 5x^2 - 2$, find the following functions.

a. $(f \circ g)(x)$; b. $(g \circ f)(x)$; c. $(f \circ g)(-1)$; d. $(g \circ f)(-1)$

$fog(x) = 5(5x^2-2)-4 = 25x^2-10-4 = 25x^2-14$

$gof(x) = 5(5x-4)^2-2 = 5(25x^2-40x+16)-2$
$= 125x^2-200x+78$

a. $(f \circ g)(x) =$ $25x^2-14$ (Simplify your answer.)

b. $(g \circ f)(x) =$ $125x^2-200x+78$ (Simplify your answer.)

c. $(f \circ g)(-1) =$ 11 (Simplify your answer.) $fog(-1) = 25(-1)^2-14 = 25-14 = 11$

d. $(g \circ f)(-1) =$ 403 (Simplify your answer.) $gof(-1) = 125(-1)^2-200(-1)+78 = 125+200+78 = 403$

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10. For $f(x) = \sqrt{x}$ and $g(x) = x + 2$, find the following functions.

a. $(f \circ g)(x)$; b. $(g \circ f)(x)$; c. $(f \circ g)(7)$; d. $(g \circ f)(7)$

$fog(x) = \sqrt{x+2}$

$gof(x) = \sqrt{x}+2$.

a. $(f \circ g)(x) =$ $\sqrt{x+2}$
(Simplify your answer.)

b. $(g \circ f)(x) =$ $\sqrt{x}+2$
(Simplify your answer.)

$fog(7) = \sqrt{7+2} = \sqrt{9} = 3$.

c. $(f \circ g)(7) =$ 3
(Simplify your answer.)

$gof(7) = \sqrt{7}+2$

d. $(g \circ f)(7) =$ $\sqrt{7}+2$.
(Simplify your answer.)

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11. For $f(x) = \dfrac{4}{x+2}$ and $g(x) = \dfrac{5}{x}$, find

a. $(f \circ g)(x)$; b. the domain of $f \circ g$

$fog(x) = \dfrac{4}{\frac{5}{x}+2} = \dfrac{4}{\frac{5}{x}+\frac{2x}{x}} = \dfrac{4}{\frac{5+2x}{x}} = 4 \cdot \dfrac{x}{5+2x} = \dfrac{4x}{5+2x}$

a. $(f \circ g)(x) =$ $\dfrac{4x}{5+2x}$
(Simplify your answer.)

$5+2x = 0 \Rightarrow 2x = -5 \Rightarrow x = -\dfrac{5}{2}$.

D: $x = -\dfrac{5}{2}$

Also, we need to exclude the values that make the denominator of $g(x)$ zero. That is $x = 0$.

b. What is the domain of $f \circ g$?

Domain of the composition: $x \neq -\frac{5}{2}, 0$.

The domain is $(-\infty, -\frac{5}{2}) \cup (-\frac{5}{2}, 0) \cup (0, \infty)$.
(Simplify your answer. Type your answer in interval notation. Use integers or fractions for any numbers in the expression.)

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12. For $f(x) = \sqrt{x}$ and $g(x) = x + 3$, find

a. $(f \circ g)(x)$; b. the domain of $f \circ g$

$fog(x) = \sqrt{x+3}$

a. $(f \circ g)(x) =$ $\sqrt{x+3}$
(Simplify your answer.)

Domain of the composition:

$x+3 \geq 0 \Rightarrow x \geq -3$.

b. What is the domain of $f \circ g$?

The domain is $[-3, \infty)$.
(Simplify your answer. Type your answer in interval notation. Use integers or fractions for any numbers in the expression.)

$[-3, \infty)$.

1. D. $(-\infty,\infty)$

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2. $(-\infty,-9)\cup(-9,-7)\cup(-7,\infty)$

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3. $[-14,\infty)$

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4. $(-\infty,5]$

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5. $7x+14$

   $(-\infty,\infty)$

   $5x-2$

   $(-\infty,\infty)$

   $6x^2+54x+48$

   $(-\infty,\infty)$

   $\frac{6x+6}{x+8}$

   $(-\infty,-8)\cup(-8,\infty)$

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6. $4x^2-25x-56$

   $(-\infty,\infty)$

   $4x^2-27x-40$

   $(-\infty,\infty)$

   $4x^3-58x^2+160x+384$

   $(-\infty,\infty)$

   $4x+6$

   $(-\infty,8)\cup(8,\infty)$

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7. $\sqrt{x+5}+\sqrt{x+1}$

   $[-1,\infty)$

   $\sqrt{x+5}-\sqrt{x+1}$

   $[-1,\infty)$

   $\sqrt{x^2+6x+5}$

   $[-1,\infty)$

   $\frac{\sqrt{x^2+6x+5}}{x+1}$

   $(-1,\infty)$

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8. $3x + 3$

$3x + 7$

9

13

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9. $25x^2 - 14$

$125x^2 - 200x + 78$

11

403

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10. $\sqrt{x+2}$

$\sqrt{x} + 2$

3

$\sqrt{7} + 2$

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11. $\dfrac{4x}{5+2x}$

$\left(-\infty, -\dfrac{5}{2}\right) \cup \left(-\dfrac{5}{2}, 0\right) \cup (0, \infty)$

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12. $\sqrt{x+3}$

$[-3, \infty)$
