

1. You should be able to plug in numbers and variables into a function and simplify.

a. Given $g(x) = \frac{3x-5}{x+4}$, evaluate $g(2)$.

b. Given $h(x) = \frac{x^2-1}{x-1}$, evaluate $h(3)$.

c. Given $p(x) = \frac{5-2x}{2x+1}$, evaluate $p(-1)$

d. Given $f(x) = 2x - 3$, find and simplify $f(a + 1) + f(a)$.

e. Given $g(x) = x^2 + 4$, find and simplify $g(a) - g(a - 2)$.

f. Given $h(x) = 3x + 5$, find and simplify $h(2a) + h(a + 1)$.

g. Given $p(x) = 5 - x$, find and simplify $p(a + 4) - p(a)$.

Given

$$f(x) = \begin{cases} x + 2 & x < 0 \\ x^2 & 0 \leq x < 3 \\ 5 & x \geq 3 \end{cases}$$

Find:

h.

$$f(-1), \quad f(0), \quad f(2), \quad f(4)$$

Given

$$g(x) = \begin{cases} 2x & x < 1 \\ x - 3 & 1 \leq x < 5 \\ \sqrt{x} & x \geq 5 \end{cases}$$

Find:

$$g(0), \quad g(1), \quad g(4), \quad g(9)$$

Given

$$h(x) = \begin{cases} x^2 - 1 & x \leq -2 \\ 3 & -2 < x < 2 \\ x + 1 & x \geq 2 \end{cases}$$

Find:

i. $h(-3), h(-2), h(0), h(2)$

Given

$$p(x) = \begin{cases} \sqrt{x-1} & 1 \leq x < 4 \\ x & x < 1 \\ x^2 - 9 & x \geq 4 \end{cases}$$

Find:

j. $p(0), p(1), p(3), p(4)$

2. You should be able to find $f + g, f - g, g - f, f \cdot g, g \cdot f, \frac{f}{g}, \frac{g}{f}$ and their domains

a. Given $f(x) = 2x - 1$ and $g(x) = x^2 + 4$, find and simplify

- | | |
|-----------------------|------------------------------------|
| i. $(f + g)(x),$ | v. $(g \cdot f)(x),$ |
| ii. $(f - g)(x),$ | vi. $\left(\frac{f}{g}\right)(x),$ |
| iii. $(g - f)(x),$ | vii. $\left(\frac{g}{f}\right)(x)$ |
| iv. $(f \cdot g)(x),$ | |

b. Given $f(x) = x^2$ and $g(x) = 3x - 5$, find and simplify

- | | |
|-----------------------|------------------------------------|
| i. $(f + g)(x),$ | v. $(g \cdot f)(x),$ |
| ii. $(f - g)(x),$ | vi. $\left(\frac{f}{g}\right)(x),$ |
| iii. $(g - f)(x),$ | vii. $\left(\frac{g}{f}\right)(x)$ |
| iv. $(f \cdot g)(x),$ | |

c. Given $f(x) = 4 - x$ and $g(x) = x + 2$, find and simplify

- | | |
|-----------------------|------------------------------------|
| i. $(f + g)(x),$ | v. $(g \cdot f)(x),$ |
| ii. $(f - g)(x),$ | vi. $\left(\frac{f}{g}\right)(x),$ |
| iii. $(g - f)(x),$ | vii. $\left(\frac{g}{f}\right)(x)$ |
| iv. $(f \cdot g)(x),$ | |

- d. Given $f(x) = \sqrt{x}$ and $g(x) = x - 1$, find and simplify
- | | |
|------------------------|-------------------------------------|
| i. $(f + g)(x)$, | v. $(g \cdot f)(x)$, |
| ii. $(f - g)(x)$, | vi. $\left(\frac{f}{g}\right)(x)$, |
| iii. $(g - f)(x)$, | vii. $\left(\frac{g}{f}\right)(x)$ |
| iv. $(f \cdot g)(x)$, | |
3. You should be able to find $f \circ g, g \circ f, f \circ f, g \circ g$ and their domains
- a. Given $f(x) = \frac{1}{x}$ and $g(x) = x - 3$, find and simplify
- | | |
|------------------------|-------------------------|
| i. $(f \circ g)(x)$, | iii. $(f \circ f)(x)$, |
| ii. $(g \circ f)(x)$, | iv. $(g \circ g)(x)$ |
- b. Given $f(x) = \sqrt{x}$ and $g(x) = x^2 - 1$, find and simplify
- | | |
|------------------------|-------------------------|
| i. $(f \circ g)(x)$, | iii. $(f \circ f)(x)$, |
| ii. $(g \circ f)(x)$, | iv. $(g \circ g)(x)$ |
- c. Given $f(x) = \frac{1}{x+2}$ and $g(x) = 2x + 1$, find and simplify
- | | |
|------------------------|-------------------------|
| i. $(f \circ g)(x)$, | iii. $(f \circ f)(x)$, |
| ii. $(g \circ f)(x)$, | iv. $(g \circ g)(x)$ |
- d. Given $f(x) = 3x - 2$ and $g(x) = \frac{1}{x+1}$, find the
- Domain of $(f \circ g)(x)$,
 - Domain of $(g \circ f)(x)$,
 - Domain of $(f \circ f)(x)$,
 - Domain of $(g \circ g)(x)$
- e. Given $f(x) = \frac{1}{x}$ and $g(x) = x^2 + 4$, find the
- Domain of $(f \circ g)(x)$,
 - Domain of $(g \circ f)(x)$,
 - Domain of $(f \circ f)(x)$,
 - Domain of $(g \circ g)(x)$
- f. Given $f(x) = 2x + 1$ and $g(x) = \sqrt{x - 3}$, find the
- Domain of $(f \circ g)(x)$,
 - Domain of $(g \circ f)(x)$,
 - Domain of $(f \circ f)(x)$,
 - Domain of $(g \circ g)(x)$
- g. Given $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{x-4}$, find the
- Domain of $(f \circ g)(x)$,
 - Domain of $(g \circ f)(x)$,
 - Domain of $(f \circ f)(x)$,
 - Domain of $(g \circ g)(x)$

4. You should be able to simplify expressions using exponent rules

a. Simplify the expression:

$$\sqrt{\frac{18xy^5}{x^4}}$$

b. Simplify the expression:

$$\frac{(5x^7y^3)}{x^2y^6}$$

c. Simplify the expression:

$$(3a^2b^{-1})^3$$

d. Simplify the expression:

$$\frac{(2m^3n^2)^2}{4mn^5}$$

e. Simplify the expression:

$$x^{-2}y^4 \cdot (x^3y^{-1})^2$$

5. You should be able to simplify complex fractions

a. Simplify the expression

$$\frac{\frac{1}{2x}}{1 + \frac{1}{2x+1}}$$

b. Simplify the expression

$$\frac{2}{\frac{1}{x} + 4}$$

c. Simplify the expression

$$\frac{\frac{5}{x+1}}{\frac{2}{x} - 1}$$

d. Simplify the expression

$$\frac{1 + \frac{1}{x}}{\frac{3}{x-4}}$$

e. Rationalize the denominator in the following expression

$$\frac{1}{\sqrt{x+3} - \sqrt{3}}$$

f. Rationalize the denominator in the following expression

$$\frac{2}{\sqrt{x} - \sqrt{5}}$$

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- g. Rationalize the denominator in the following expression

$$\frac{1}{\sqrt{2x+1}-1}$$

- h. Rationalize the denominator in the following expression

$$\frac{3}{\sqrt{x+4}-2}$$

6. You should be able to factor any expression

- a. Factor and simplify the expression:

$$18(5x-2)^4 + 6(5x-2)^5$$

- b. Factor and simplify the expression:

$$15(2x+3)^6 - 5(2x+3)^7$$

- c. Factor and simplify the expression:

$$8(3x-1)^3 + 20(3x-1)^4$$

- d. Completely factor the expression:

$$81x^2 - 25y^2$$

- e. Completely factor the expression:

$$49a^2 - 144b^2$$

- f. Completely factor the expression:

$$36m^2 - 4n^2$$

- g. Simplify the expression:

$$\frac{3x^2 + 17x - 6}{9x^2 + 6x - 3}$$

- h. Simplify the expression:

$$\frac{6x^2 + 15x - 9}{3x^2 - 12}$$

- i. Simplify the expression:

$$\frac{9x^2 - 25}{3x^2 + 12x + 12}$$

7. You should be able to factor quadratics and find its zeros.

a. Given $f(x) = 2x^2 - 9x - 5$, solve $f(x) = 0$.

b. Given $f(x) = 4x^2 + 7x - 2$, solve $f(x) = 0$

c. Given $f(x) = 5x^2 - 13x + 6$, solve $f(x) = 0$

d. Given $f(x) = 3x^2 + 2x - 8$, solve $f(x) = 0$

8. You should be able to find the domain of any given function
 a. Determine the domain of the function

$$f(x) = \frac{\sqrt{x-2}}{x^2-16}$$

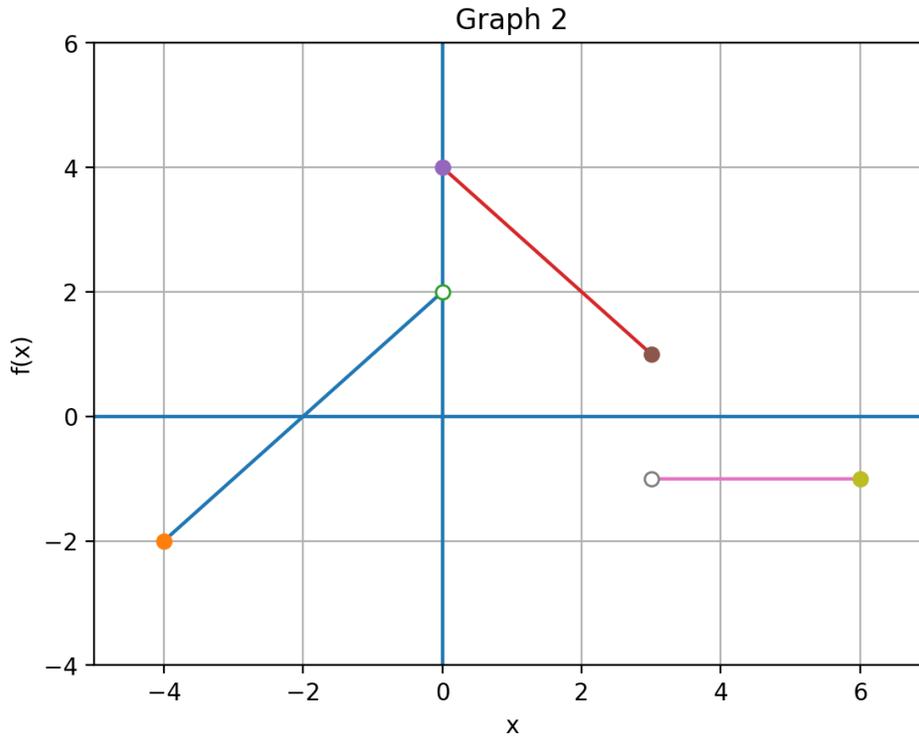
- b. Determine the domain of the function

$$f(x) = \frac{x-1}{\sqrt{3x}}$$

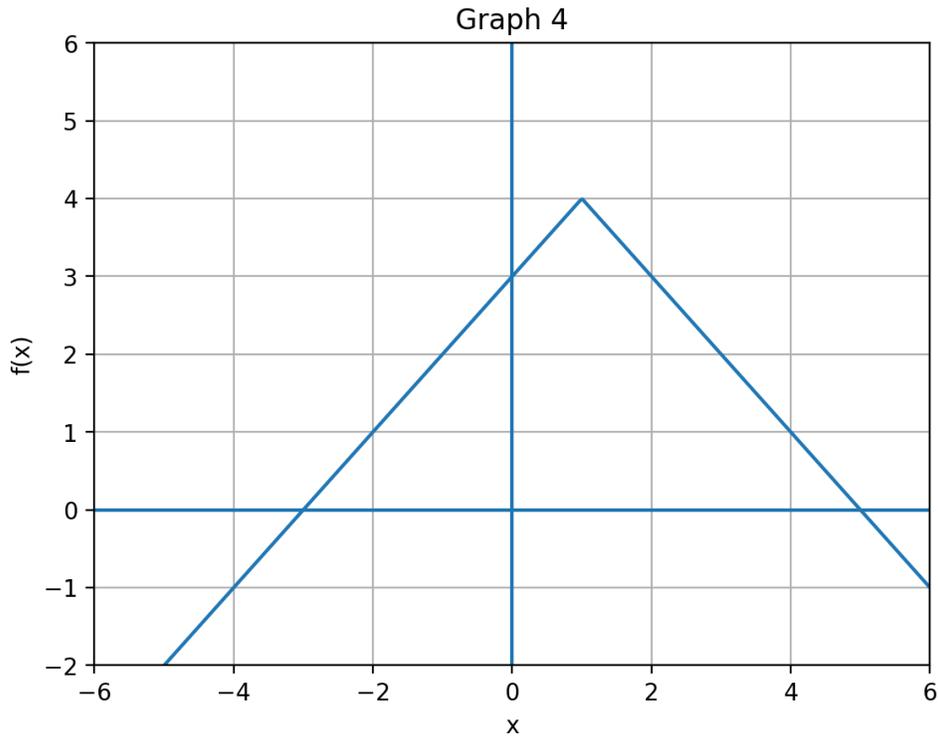
- c. Determine the domain of the function

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

9. You should be able to find the range of a function given its graph
 a. Determine the range of $f(x)$ given its graph below:



b) Determine the range of $f(x)$ given its graph below:



c) Determine the range of $f(x)$ given its graph below:

