

## Piecewise, Composite & Inverse Functions Review

Evaluate each piecewise function for the following values:  $x = -4$ ,  $x = 0$ ,  $x = 3$

$$1. f(x) = \begin{cases} 5x + 3 & \text{if } x < 3 \\ \frac{2}{3}x - 1 & \text{if } x \geq 3 \end{cases}$$

$$f(-4) = 5(-4) + 3 = \boxed{-17}$$

$$f(0) = 5(0) + 3 = \boxed{3}$$

$$f(3) = \frac{2}{3}(3) - 1 = \boxed{1}$$

$$2. f(x) = \begin{cases} -3x - 4 & \text{if } x \leq -2 \\ 5x & \text{if } -2 < x < 3 \\ x^2 + 4 & \text{if } x \geq 3 \end{cases}$$

$$f(-4) = -3(-4) - 4 = \boxed{8}$$

$$f(0) = 5(0) = \boxed{0}$$

$$f(3) = (3)^2 + 4 = \boxed{13}$$

3. The zoo has different prices for admittance depending on age. Children from 6 to 13 are charged \$3. People aged 14 to 62 years are charged \$10. All other people are admitted for free. Create a piecewise function for this situation using function notation with parameters.

$$f(x) = \begin{cases} \$3 & 6 \leq x \leq 13 \\ \$10 & 14 \leq x \leq 62 \\ \$0 & x < 0, x > 62 \end{cases}$$

Use the following functions for #4 - 9:

$$f(x) = x^2 - 4x + 15$$

$$g(x) = 2x^2$$

$$f(-1) = (-1)^2 - 4(-1) + 15 = 20$$

$$g(1) = 2$$

4. Find  $(f - k)(x)$

$$x^2 - 4x + 15 - (-3x + 2)$$

$$\boxed{x^2 - x + 13}$$

6. Find  $(fg)(x)$

$$(x^2 - 4x + 15)(2x^2)$$

$$\boxed{2x^4 - 8x^3 + 30x^2}$$

8. Find  $(h/g)(x)$

$$\boxed{\frac{\sqrt{39-x}}{2x^2}}$$

$$h(x) = \sqrt{39-x}$$

$$k(x) = -3x + 2$$

$$k(-1) = -3(-1) + 2$$

$$= 5$$

\*5. Evaluate  $k(h(3))$

$$h(3) = \sqrt{39-3} = \sqrt{36} = 6$$

$$k(6) = -3(6) + 2 = \boxed{-16}$$

7. Evaluate  $(g + k + f)(-1)$

$$f(-1) = 20$$

$$k(-1) = 5$$

$$g(1) = 2$$

$$\boxed{27}$$

9. Find  $(f \circ k)(x)$

$$f(k(x)) = (-3x+2)^2 - 4(-3x+2) + 15$$

$$= 9x^2 - 12x + 4 + 12x - 8 + 15$$

$$\boxed{9x^2 + 11}$$

Write the inverses of the given functions. Your answers should be in function notation.

10.  $f(x) = 5x - 9$

$$y = 5x - 9$$

$$x = 5y - 9$$

$$\boxed{\frac{x+9}{5} = y}$$

11.  $g(x) = 3(2x - 4)$

$$y = 3(2x - 4)$$

$$x = 3(2y - 4)$$

$$x = 6y - 12$$

$$x + 12 = 6y$$

$$\boxed{y = \frac{1}{6}x + 2}$$

or  $\boxed{\frac{x+12}{6}}$

12.  $h(x) = 2x^2 + 7$

$$y = 2x^2 + 7$$

$$x = 2y^2 + 7$$

$$\frac{x-7}{2} = y^2$$

$$\boxed{y = \pm \sqrt{\frac{x-7}{2}}}$$

13.  $f(x) = \frac{1}{3}x - 4$

$$y = \frac{1}{3}x - 4$$

$$x = \frac{1}{3}y - 4$$

$$x + 4 = \frac{1}{3}y$$

$$\boxed{y = 3x + 12}$$

14.  $g(x) = \sqrt{2x+5}$

$$y = \sqrt{2x+5}$$

$$x = (\sqrt{2y+5})^2$$

$$x^2 = 2y+5$$

$$x^2 - 5 = 2y$$

$$\boxed{y = \frac{x^2 - 5}{2}}$$