

Functions Battle

$$\begin{aligned} \textcircled{1} h(-2) &= (-2)^3 - 2(-2) \\ &= -8 + 4 \\ &= \boxed{-4} \end{aligned}$$

$$\textcircled{2} (fg)(x) = \frac{1}{x} \cdot \frac{x}{x+1}$$

$$= \frac{x}{x(x+1)}$$

$$= \boxed{\frac{1}{x+1}}$$

$$\begin{aligned} (fg)(-3) &= \frac{1}{-3+1} \\ &= \boxed{-\frac{1}{2}} \end{aligned}$$

~~$$\textcircled{3} 0 = \frac{x^2 - 25}{1 \cdot 25}$$~~

$$0 = x^2 - 25$$

$$\sqrt{25} = \sqrt{x^2}$$

$$\boxed{x=5 \text{ or } x=-5}$$

$$\textcircled{4} D: (-4, \infty)$$

$$R: (-2, \infty)$$

$$\begin{aligned} \textcircled{5} (f-g)(x) &= x^2 - (1-x) \\ &= x^2 - 1 + x \\ &= \boxed{x^2 + x - 1} \end{aligned}$$

$\textcircled{6}$ under the root must be positive:

$$-2x + 6 \geq 0$$

$$-\frac{2x}{-2} \geq -\frac{6}{-2} \leftarrow \begin{array}{l} \text{division by a neg.} \\ \text{flips inequality sign} \end{array}$$

$$x \leq 3 \Rightarrow \boxed{D: (-\infty, 3]}$$

$$\textcircled{7} x^2 = 7x - 10 \leftarrow \text{get 1 side} = \text{to } 0$$

$$x^2 - 7x + 10 = 0$$

$$(x-2)(x-5) = 0$$

$$x-2=0 \quad x-5=0$$

$$\boxed{x=2, x=5}$$

$$\textcircled{8} 2x+1, x \leq -1 \leftarrow \text{defined for any } x \text{ less than } -1$$

$$f(-2) = 2(-2) + 1$$

$$= -4 + 1$$

$$= \boxed{-3}$$

$$\textcircled{9} (f+g)(2) = (2)^2 + 1 - 2$$

$$= 4 + 1 - 2$$

$$= 5 - 2$$

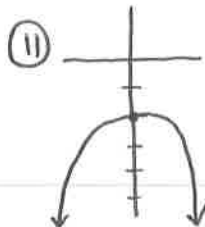
$$= \boxed{3}$$

$$\textcircled{10} (0)^2 = (\sqrt{x^2 - 16})^2$$

$$0 = x^2 - 16$$

$$\sqrt{16} = \sqrt{x^2}$$

$$\boxed{x=4 \text{ or } x=-4}$$



$$d: (-\infty, \infty)$$

$$r: [-\infty, -2]$$

$$\textcircled{12} j(k(x)) = (x-1)^2 - 2$$

$$= (x-1)(x-1) - 2$$

$$= x^2 - 2x + 1 - 2$$

$$= \boxed{x^2 - 2x - 1}$$

$$(13) \left(\frac{f}{g}\right)(x) = \frac{10}{x^2-2x}$$

Domain: denom $\neq 0$

$$x^2-2x \neq 0$$

$$x(x-2) \neq 0$$

$$x \neq 0, x-2 \neq 0$$

$$x \neq 0, x \neq 2$$

$$\text{So } D: (-\infty, 0) \cup (0, 2) \cup (2, \infty)$$

$$(14) 5, \quad 0 \leq x < 1 \quad \leftarrow \begin{array}{l} \text{defined for} \\ x \text{ between } 0 \text{ and } 1 \end{array}$$

$$f(0) = 5$$

$$(15) \begin{aligned} g(y+3) &= \frac{1}{(y+3)^2-1} \\ &= \frac{1}{(y+3)(y+3)-1} \\ &= \frac{1}{y^2+6y+9-1} \\ &= \frac{1}{y^2+6y+8} \end{aligned}$$

$$(16) (fg)(x) = (x^2+2)(x-3) \\ = x^3-3x^2+2x-6$$

$$(17) (f \circ g)(x) = 7(3x-5)^2 + 6(3x-5) - 2 \\ = 7(3x-5)(3x-5) + 18x - 30 - 2 \\ = 7(9x^2 - 30x + 25) + 18x - 32 \\ = 63x^2 - 210x + 175 + 18x - 32 \\ = 63x^2 - 192x + 143$$