

099 § 5.1 #s 3-21, 33-39, 45-55, 59, 63

$$\textcircled{3} h(t) = \frac{t-3}{t+1} \Rightarrow h(0) = \frac{-3}{1} = \boxed{-3 = h(0)}$$

$$h(-3) = \frac{-3-3}{-3+1} = \frac{-6}{-2} = \boxed{3 = h(-3)}$$

$$h(3) = \frac{3-3}{3+1} = \frac{0}{4} = \boxed{0 = h(3)}$$

$$h(-1) = \frac{-1-3}{-1+1} = \frac{-4}{0} \quad \cancel{\boxed{h(-1)}}$$

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

#s 5-10 Find Domain \mathcal{D}

$$\textcircled{5} f(x) = \frac{x-3}{x-1}$$

Need $x-1 \neq 0$

$$\mathcal{D} = \{x \mid x \neq 1\} = (-\infty, 1) \cup (1, \infty)$$

$$\textcircled{7} g(x) = \frac{x^2-4}{x-2}$$

Need $x-2 \neq 0$

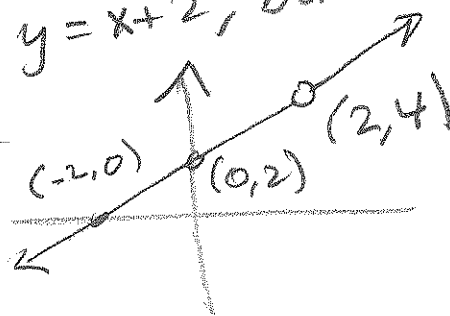
$$\mathcal{D} = \{x \mid x \neq 2\} = (-\infty, 2) \cup (2, \infty)$$

Note: $\frac{x^2-4}{x-2} = \frac{(x-2)(x+2)}{x-2} = x+2$

So, it looks just like $y = x+2$, but it has

a hole @ $x=2$

$$y = 2+2 = 4$$



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(9) $h(t) = \frac{t-4}{t^2-16}$ Need $t^2-16 \neq 0$
 $(t-4)(t+4) \neq 0$

$$D = \left\{ t \mid t \neq 4 \text{ and } t \neq -4 \right\}$$
$$= (-\infty, -4) \cup (-4, 4) \cup (4, \infty)$$

#5 11-14 Reduce to lowest terms.

(11) $\frac{x^2-16}{6x+24} = \frac{(x-4)(x+4)}{6(x+4)} = \frac{x-4}{6} \quad (x \neq -4)$

(13) $\frac{a^4-81}{a-3} = \frac{(a^2-9)(a^2+9)}{a-3} = \frac{(a-3)(a+3)(a^2+9)}{a-3}$

$$= (a+3)(a^2+9) \quad (a \neq 3)$$

(15) $\frac{20y^2-45}{10y^2-5y-15} = \frac{5(4y^2-9)}{5(2y^2-y-3)}$

$$= \frac{(2y-3)(2y+3)}{(2y-3)(y+1)} = \frac{2y+3}{y+1} \quad \left(y \neq \frac{3}{2} \right)$$

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$$\textcircled{17} \quad \frac{12y - 2xy - 2x^2y}{6y - 4xy - 2x^2y} = \frac{2y(6 - x - x^2)}{2y(3 - 2x - x^2)}$$

$$= \frac{6 - x - x^2}{3 - 2x - x^2} = \frac{x^2 + x - 6}{x^2 + 2x - 3} = \frac{(x+3)(x-2)}{(x+3)(x-1)}$$

$$= \boxed{\frac{x-2}{x-1} \quad x \neq -3}$$

$$\textcircled{19} \quad \frac{(x-3)^2(x+2)}{(x+2)^2(x-3)} = \boxed{\frac{(x+3)'}{(x+2)'}} \quad (x \neq 3)$$

$$\textcircled{21} \quad \frac{x^3+1}{x^2-1} = \frac{(x+1)(x^2-x+1)}{(x-1)(x+1)} = \boxed{\frac{x^2-x+1}{x-1}} \quad (x \neq -1)$$

$$\textcircled{33} \quad \frac{a^3+b^3}{a^2-b^2} = \frac{(a+b)(a^2-ab+b^2)}{(a-b)(a+b)} = \boxed{\frac{a^2-ab+b^2}{a-b}} \quad (a \neq -b)$$

$$\textcircled{35} \quad \frac{8x^4-8x}{4x^4+4x^3+4x^2} = \frac{8x(x^3-1)}{4x^2(x^2+x+1)} =$$
$$= \frac{2(x-1)(x^2+x+1)}{x(x^2+x+1)} = \boxed{\frac{2(x-1)}{x}}$$

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$$\textcircled{37} \quad \frac{2x + 2x + 3a + 6}{2y + 2y - 4a - 8} = \frac{x(a+2) + 3(a+2)}{y(a+2) - 4(a+2)}$$

$$= \frac{(a+2)(x+3)}{(a+2)(y-4)} = \boxed{\frac{x+3}{y-4} \quad (a \neq -2)}$$

$$\textcircled{39} \quad \frac{x^4 + 3x^2 - 4x - 12}{x^2 + x - 6} = \frac{x^2(x+3) - 4(x+3)}{(x+3)(x-2)}$$

$$= \frac{(x+3)(x^2-4)}{(x+3)(x-2)} = \frac{x^2-4}{x-2} \quad (x \neq -3)$$

$$= \frac{(x-2)(x+2)}{x-2} = \boxed{x+2 \quad (x \neq -3, x \neq 2)}$$

#345-50 Reduce to Lowest terms

$$\textcircled{45} \quad \frac{x-4}{4-x} = \frac{x-4}{-(x-4)} = \frac{1}{-1} = \boxed{-1} \quad (x \neq 4)$$

$$\textcircled{47} \quad \frac{y^2-36}{6-y} = \frac{(y-6)(y+6)}{-(y-6)} = \frac{y+6}{-1} = \boxed{-y-6} \quad (y \neq 6)$$

$$\textcircled{49} \quad \frac{1-9a^2}{9a^2-6a+1} = \frac{(1-3a)(1+3a)}{(3a-1)(3a-1)} = \frac{-(3a-1)(3a+1)}{(3a-1)(3a-1)}$$

$$= \frac{-(3a+1)}{3a-1} = \boxed{\frac{-3a-1}{3a-1} \quad (a \neq \frac{1}{3})}$$

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51-54 Simplify

$$(51) \frac{(3x-5) - (3a-5)}{x-a} = \frac{3x-5-3a+5}{x-a}$$

$$= \frac{3x-3a}{x-a} = \frac{3(x-a)}{(x-a)} = 3 \quad (x \neq a)$$

$$(53) \frac{(x^2-4) - (a^2-4)}{x-a} = \frac{x^2-4-a^2+4}{x-a}$$

$$= \frac{x^2-a^2}{x-a} = \frac{(x-a)(x+a)}{x-a} = x+a \quad (x \neq a)$$

~~55~~ # 55-64 $\frac{f(x)-f(a)}{x-a}$ (a) (b) $\frac{f(x+h)-f(x)}{h}$

(5) $f(x) = 4x$

$$(a) \frac{4x-4a}{x-a} = \frac{4(x-a)}{x-a} = 4 \quad (x \neq a)$$

$$(b) \frac{4(x+h)-4x}{h} = \frac{4x+4h-4x}{h} = \frac{4h}{h} = 4 \quad (h \neq 0)$$

$$(59) f(x) = x^2 \quad (a) \frac{x^2-a^2}{x-a} = \frac{(x-a)(x+a)}{x-a} = x+a \quad (x \neq a)$$

$$(b) \frac{(x+h)^2 - x^2}{h} = \frac{x^2 + 2xh + h^2 - x^2}{h} = \frac{2xh + h^2}{h}$$

$$= 2x+h \quad (h \neq 0)$$

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(63) $P(x) = x^2 - 3x + 4$

$$(a) \frac{x^2 - 3x + 4 - (a^2 - 3a + 4)}{x - a}$$

$$= \frac{x^2 - 3x + 4 - a^2 + 3a - 4}{x - a} = \frac{x^2 - a^2 - 3x + 3a}{x - a}$$

$$= \frac{(x - a)(x + a) - 3(x - a)}{x - a}$$

$$= \frac{(x - a)[x + a - 3]}{x - a}$$

$$= \boxed{x + a - 3 \quad (x \neq a)}$$

(b) $\frac{(x+h)^2 - 3(x+h) + 4 - (x^2 - 3x + 4)}{h}$

$$= \frac{x^2 + 2xh + h^2 - 3x - 3h + 4 - x^2 + 3x - 4}{h}$$

$$= \frac{2xh + h^2 - 3h}{h} = \boxed{2x + h - 3 \quad (h \neq 0)}$$