

$$\begin{aligned}
 1a.i \quad (f+g+h)(x) &= f(x) + g(x) + h(x) \\
 &= (2x+5) + (x^2-5x+3) + (x^3+6x^2+17x+2) \\
 &= x^3 + 7x^2 + 14x + 10
 \end{aligned}$$

$$\begin{aligned}
 ii \quad (f+g+h)(1) &= (1)^3 + 7(1)^2 + 14(1) + 10 \\
 &= 32
 \end{aligned}$$

$$\begin{aligned}
 1.b. \quad (3x+2)(x+4) - x(x+1) &= (2x+1)(x+4) - 12 \\
 3x^2 + 14x + 8 - x^2 - x &= 2x^2 + 9x + 4 - 12 \\
 2x^2 + 13x + 8 &= 2x^2 + 9x - 8 \\
 13x + 8 &= 9x - 8 \\
 8 &= -4x - 8 \\
 16 &= -4x \\
 -4 &= x \\
 &= \{-4\}
 \end{aligned}$$

$$\begin{aligned}
 2a.i \quad \left(\frac{3}{2}y + \frac{2}{3}\right) \left(\frac{3}{2}y - \frac{2}{3}\right) \\
 = \frac{9}{4}y^2 - \frac{4}{9}
 \end{aligned}$$

$$\begin{aligned}
 ii \quad [5 - (a+b)][5 + (a+b)] \\
 = 25 - (a+b)^2 \\
 = 25 - (a^2 + 2ab + b^2) \\
 = 25 - a^2 - 2ab - b^2
 \end{aligned}$$

$$\begin{aligned}
 iii \quad [(m+4) - h]^2 \\
 = (m+4)^2 - 2 \cdot (m+4) \cdot h + h^2 \\
 = m^2 + 8m + 16 - 2mh - 8h + h^2
 \end{aligned}$$

$$\begin{aligned}
 2.b. \quad & \frac{x-1}{x^2-16} + \frac{1}{x+4} - \frac{4x+1}{3x^2-7x-20} \\
 &= \frac{x-1}{(x-4)(x+4)} + \frac{1}{x+4} - \frac{4x+1}{(3x+5)(x-4)} \\
 &= \frac{(x-1)(3x+5) + 1 \cdot (x-4)(3x+5) - (4x+1)(x+4)}{(x-4)(x+4)(3x+5)} \\
 &= \frac{3x^2+2x-5 + 3x^2-7x-20 - 4x^2-17x-4}{(x-4)(x+4)(3x+5)} \\
 &= \frac{2x^2-22x-29}{(x-4)(x+4)(3x+5)} //
 \end{aligned}$$

$$\begin{aligned}
 3.a. \quad & \frac{5m-5}{m^2+6m} \cdot \frac{m^2+2m-24}{m^2+3m-4} \div \frac{3m^2-17m+20}{5m^3+20m^2} \\
 &= \frac{5\cancel{(m-1)}}{\cancel{m+6}} \cdot \frac{\cancel{1} \cdot \cancel{(m+6)} \cdot \cancel{(m-4)}}{\cancel{(m+4)} \cdot \cancel{(m-1)}} \cdot \frac{5\cancel{m^2} \cdot \cancel{(m+4)}}{(3m-5)\cancel{(m-4)}} \\
 &= \frac{25m}{3m-5} //
 \end{aligned}$$

$$\begin{aligned}
 3.b.i \quad & 8a^4b^2 + 12a^3b^3 - 36ab^4 \\
 &= 4ab^2(2a^3 + 3a^2b - 9b^2) //
 \end{aligned}$$

$$\begin{aligned}
 ii \quad & c^3 - c^2 + 5c - 5 \\
 &= c^2(c-1) + 5(c-1) \\
 &= (c-1)(c^2+5) //
 \end{aligned}$$

$$\begin{aligned}
 iii \quad & 24m^2 + 58mn + 9n^2 \\
 &= (6m+n)(4m+9n) //
 \end{aligned}$$

$$\begin{aligned}
 iv \quad & 18x^2 + 37x - 20 \\
 &= (9x-4)(2x+5) //
 \end{aligned}$$

$$\begin{aligned}
 v \quad & -24y^2z - 39yz + 18z \\
 &= -3z(8y^2 + 13y - 6) \\
 &= -3z(8y-3)(y+2) //
 \end{aligned}$$



b.

$$\frac{-6}{x^2 + 5x + 6}$$

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

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

$$= \frac{2}{x+3} - \frac{3}{x+2}$$

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

$$= \frac{-6}{2x+4-3x-9}$$

$$= \frac{-6}{-x-5}$$

$$= \frac{6}{x+5}$$

c.

$$\begin{array}{r|rrrr} -3 & 1 & 0 & -13 & -17 \\ & & -3 & 9 & 12 \\ \hline & 1 & -3 & -4 & -5 \end{array}$$

$$f(-3) = -5 //$$

d.

$$\frac{x^4 y^4 + 8x^2 y^2 - 4xy}{4x^3 y}$$

$$= \frac{x^4 y^4}{4x^3 y} + \frac{8x^2 y^2}{4x^3 y} - \frac{4xy}{4x^3 y}$$

$$= \frac{x y^3}{4} + \frac{2y}{x} - \frac{1}{x^2} //$$



$$5. \quad \frac{7}{y^2 + y - 12} - \frac{4y}{y^2 + 7y + 12} = \frac{6}{y^2 - 9}$$

$$\frac{7}{(y+4)(y-3)} - \frac{4y}{(y+4)(y+3)} = \frac{6}{(y-3)(y+3)} \quad x \neq -4, -3, 3$$

multiply both sides by LCD:  $(y+4)(y+3)(y-3)$

$$7(y+3) - 4y(y-3) = 6(y+4)$$

$$7y + 21 - 4y^2 + 12y = 6y + 24$$

$$-4y^2 + 19y + 21 = 6y + 24$$

$$0 = 4y^2 - 13y + 3$$

$$0 = (4y-1)(y-3)$$

$$4y-1=0 \quad y-3=0$$

$$y = \frac{1}{4} \quad y = 3$$

$$\left\{ \frac{1}{4} \right\} //$$

$$6. a. \quad 2c^3 + 3c^2 = 8c + 12$$

$$2c^3 + 3c^2 - 8c - 12 = 0$$

$$c^2(2c+3) - 4(2c+3) = 0$$

$$(2c+3)(c^2-4) = 0$$

$$(2c+3)(c-2)(c+2) = 0$$

$$2c+3=0 \quad c-2=0 \quad c+2=0$$

$$c = -\frac{3}{2} \quad c = 2 \quad c = -2$$

$$\left\{ -\frac{3}{2}, -2, 2 \right\} //$$

$$\begin{aligned}
 6. \quad & \frac{a^{-2}b^{-1} - a^{-1}b^{-2}}{4a^{-2} - 4b^{-2}} \\
 &= \frac{\frac{1}{a^2b} - \frac{1}{ab^2}}{\frac{4}{a^2} - \frac{4}{b^2}} \cdot \frac{a^2b^2}{a^2b^2} \\
 &= \frac{b - a}{4b^2 - 4a^2} \\
 &= \frac{b - a}{4(b^2 - a^2)} \\
 &= \frac{b - a}{4(b - a)(b + a)} \\
 &= \frac{1}{4(b + a)}
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & \frac{5}{x-2} > \frac{3}{x} \\
 & \frac{5}{x-2} - \frac{3}{x} > 0 \\
 & \frac{5x - 3(x-2)}{x(x-2)} > 0 \\
 & \frac{5x - 3x + 6}{x(x-2)} > 0 \\
 & \frac{2x + 6}{x(x-2)} > 0
 \end{aligned}$$

zeros :	undefines
$2x + 6 = 0$	$x = 0 \quad x - 2 = 0$
$x = -3$	$x = 2$

$$\leftarrow \begin{array}{cccc} - & 0 & + & 0 & - & 0 & + \\ & -3 & & 0 & & 2 & \end{array} \rightarrow$$

i)  $(-3, 0) \cup (2, \infty)$

ii)  $\leftarrow \begin{array}{ccc} \circ & \circ & \circ \\ | & | & | \\ -3 & 0 & 2 \end{array} \rightarrow$

$$8. \quad -3m^2 > 16m + 5$$

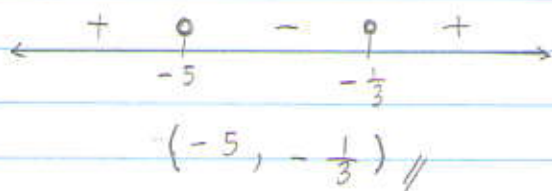
$$0 > 3m^2 + 16m + 5$$

$$0 > (3m + 1)(m + 5)$$

Zeros:

$$3m + 1 = 0 \quad m + 5 = 0$$

$$m = -\frac{1}{3} \quad m = -5$$



$$9. \quad \textcircled{1} \text{ speed of boat} = x$$

$$\textcircled{2} \quad \frac{24}{x-4} = \frac{40}{x+4}$$

	$r$	$t$	$d$
up	$x-4$	$\frac{24}{x-4}$	24
down	$x+4$	$\frac{40}{x+4}$	40

$$24(x+4) = 40(x-4)$$

$$24x + 96 = 40x - 160$$

$$96 = 16x - 160$$

$$256 = 16x$$

$$16 = x$$

$\textcircled{3}$  speed of boat is 16 mph //

$$10. \quad \textcircled{1} \text{ original width} = 2x$$

$$\text{original length} = x$$

$$\text{new width} = 2x+3$$

$$\text{new length} = x+7$$

$$\textcircled{2} \quad (2x+3)(x+7) = 40$$

$$2x^2 + 17x + 21 = 40$$

$$2x^2 + 17x - 19 = 0$$

$$(2x+19)(x-1) = 0$$

$$2x+19 = 0 \quad x-1 = 0$$

$$x = -\frac{19}{2} \quad x = 1$$

$\textcircled{3}$  original width is 2 in.  
original length is 1 in.

11.

$$f(t) = -16t^2 + 576$$

$$0 = -16t^2 + 576$$

$$0 = -16(t - 36)$$

$$0 = -16(t - 6)(t + 6)$$

$$t - 6 = 0 \quad t + 6 = 0$$

$$t = 6 \quad t = -6$$

the rock will hit the ground after 6 sec.

12. ①

	rate	x	t	=	work-done
A	$\frac{1}{x}$		x		1
F	$\frac{1}{10}$		10		1

$$\textcircled{2} \quad \left(\frac{1}{x} + \frac{1}{10}\right) \cdot 6 = 1$$

$$\frac{6}{x} + \frac{3}{5} = 1$$

$$5x \left(\frac{6}{x} + \frac{3}{5}\right) = (1) 5x$$

$$30 + 3x = 5x$$

$$30 = 2x$$

$$15 = x$$

③ Alexandra need 15 hrs //