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#51 – END Simplify the Complex Fractions.

(1) $\dfrac{\frac{10}{3x}}{\frac{5}{6x}} = \dfrac{10}{3x} \cdot \dfrac{6x}{5} = \dfrac{2 \cdot 5 \cdot 3 \cdot 2x}{3 \cdot 5 x} = \boxed{4}$

(5) $\dfrac{\frac{4}{x-1}}{\frac{x}{x-1}} = \dfrac{4}{x-1} \cdot \dfrac{x-1}{x} = \boxed{\dfrac{4}{x}}$

(9) $\dfrac{\frac{4x^2-y^2}{xy}}{\frac{2}{y}-\frac{1}{x}}$ LCD = xy, LCD = xy } LCD = xy

$= \dfrac{\left(\frac{4x^2-y^2}{xy}\right) \cdot xy}{\left(\frac{2}{y}-\frac{1}{x}\right) xy} = \dfrac{4x^2-y^2}{\frac{2xy}{y}-\frac{1xy}{x}} = \dfrac{4x^2-y^2}{2x-y}$

$= \dfrac{(2x-y)(2x+y)}{2x-y} = \boxed{2x+y}$

Another method: Combine $\frac{2}{y}-\frac{1}{x}$ into one fraction:

$$\frac{\frac{4x^2-y^2}{xy}}{\frac{2}{y}\cdot\frac{x}{x}-\frac{1}{x}\cdot\frac{y}{y}} = \frac{\frac{4x^2-y^2}{xy}}{\frac{2x-y}{xy}} = \frac{4x^2-y^2}{xy}\cdot\frac{xy}{2x-y} =$$

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(13) $\dfrac{\frac{2}{x}+\frac{3}{x^2}}{\frac{4}{x^2}-\frac{9}{x}}$ LCD $= x^2$; LCD $= x^2$; LCD $= x^2$

$$\frac{\frac{2}{x}\cdot\frac{x^2}{1}+\frac{3}{x^2}\cdot\frac{x^2}{1}}{\frac{4}{x^2}\cdot\frac{x^2}{1}-\frac{9}{x}\cdot\frac{x^2}{1}} = \frac{\frac{2x^2}{x}+\frac{3x^2}{x^2}}{\frac{4x^2}{x^2}-\frac{9x^2}{x}}$$

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

other method: Just combine things & then simplify:

$$\frac{\frac{2}{x}\cdot\frac{x}{x}+\frac{3}{x^2}}{\frac{4}{x^2}-\frac{9}{x}\cdot\frac{x}{x}} = \frac{\frac{2x+3}{x^2}}{\frac{4-9x}{x^2}} = \left(\frac{2x+3}{x^2}\right)\left(\frac{x^2}{4-9x}\right)$$

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

(17) $\dfrac{\frac{4}{5-x}+\frac{5}{x-5}}{\frac{2}{x}+\frac{3}{x-5}}$

$$= \frac{-\frac{4}{x-5}+\frac{5}{x-5}}{\frac{2}{x}\cdot\frac{x-5}{x-5}+\frac{3}{x-5}\cdot\frac{x}{x}}$$

$$= \frac{\frac{-4+5}{x-5}}{\frac{2(x-5)+3x}{x(x-5)}} = \frac{\frac{1}{x-5}}{\frac{5x-10}{x(x-5)}} = \left(\frac{1}{x-5}\right)\left(\frac{x(x-5)}{5x-10}\right)$$

$$= \frac{x}{5x-10} = \boxed{\frac{x}{5(x-2)}}$$

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(23) $$\frac{1-\frac{x}{y}}{\frac{x^2}{y^2}-1} = \frac{\frac{y}{y}-\frac{x}{y}}{\frac{x^2}{y^2}-\frac{y^2}{y^2}} = \frac{\frac{y-x}{y}}{\frac{x^2-y^2}{y^2}}$$

$$= \frac{y-x}{y} \cdot \frac{y^2}{x^2-y^2} = \frac{(y-x)(y)}{x^2-y^2} = \frac{-1(x-y)(y)}{(x-y)(x+y)}$$

$$= \boxed{\frac{-y}{x+y}}$$

(35) $$\frac{x^{-1}}{x^{-2}+y^{-2}} = \frac{\frac{1}{x}}{\frac{1}{x^2}+\frac{1}{y^2}} = \frac{\frac{1}{x}}{\frac{1}{x^2}\cdot\frac{y^2}{y^2}+\frac{1}{y^2}\cdot\frac{x^2}{x^2}}$$

$$= \frac{\frac{1}{x}}{\frac{y^2+x^2}{x^2y^2}} = \frac{1}{x} \cdot \frac{x^2y^2}{x^2+y^2} = \boxed{\frac{xy^2}{x^2+y^2}}$$

(43) $$\frac{3x^{-1}+(2y)^{-1}}{x^{-2}} = \frac{\frac{3}{x}+\frac{1}{2y}}{\frac{1}{x^2}} = \frac{\frac{3}{x}\cdot\frac{2y}{2y}+\frac{1}{2y}\cdot\frac{x}{x}}{\frac{1}{x^2}}$$

$$= \frac{\frac{6y+x}{2xy}}{\frac{1}{x^2}} = \frac{x+6y}{2xy} \cdot \frac{x^2}{1} = \frac{(x+6y)x}{2y} = \boxed{\frac{x(x+6y)}{2y}}$$