Algebra Magic

(1) $\frac{3}{x-1} - 1 = \frac{x-4}{5}$, $x \neq 1$

We know the answer

$x = 4$

$x = -5 + 1 = -4$,

$\frac{3}{3} - 1 = 0$, $\frac{3}{-5} - 1 = \frac{-8}{5}$

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(2) $\frac{3}{x-1} - 1 = \frac{x-4}{2}$, $x \neq 1$

We know the answer, $x = 4$

$x = -1$

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(3) $\frac{3}{x-1} - 1 = \frac{x-4}{a}$, a is parameter

$x \neq 1$

$3a - a(x-1) = (x-1)(x-4)$

$x^2 + (a-5)x - 4(a-1) = 0$

$\Delta = (a-5)^2 + 16(a-1) = a^2 + 6a + 9 =$

$= (a+3)^2$

$x = \frac{5-a \pm (a+3)}{2}$

$x_1 = 4$

$x_2 = -a + 1$