Rational Expressions

1. Find an equivalent rational expression in lowest terms, and identify the value(s) of the variable that must be excluded to prevent division by zero.

a) $\frac{x^2-x-6}{5x^2+10x}$

b) $\frac{3-x}{x^2-9}$

c) $\frac{3x-3y}{y^2-2xy+x^2}$

d) $\frac{x^2-7x+12}{6-5x+x^2}$

e) $\frac{x^2+5x+4}{(x+1)(x+2)(x-3)}$

f) $\frac{2(x+1)+2}{(2x+3)(x+1)-1}$

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1. Find an equivalent rational expression in lowest terms, and identify the value(s) of the variable that must be excluded to prevent division by zero.

a) $\frac{x^2-x-6}{5x^2+10x}$

$$\frac{x^2-x-6}{5x^2+10x}$$
$$=\frac{(x+2)(x-3)}{5x(x+2)}$$
$$=\frac{x-3}{5x}$$

$x \neq 0$ *and* $x \neq -2$

b) $\frac{3-x}{x^2-9}$

$$\frac{3-x}{x^2-9}$$
$$=\frac{-(x-3)}{(x-3)(x+3)}$$
$$=-\frac{1}{x+3}$$

$x \neq 3$ *and* $x \neq -3$

c) $\frac{3x-3y}{y^2-2xy+x^2}$

$$\frac{3x-3y}{y^2-2xy+x^2}$$
$$=\frac{-3(y-x)}{(y-x)(y-x)}$$
$$=-\left(\frac{3}{y-x}\right)$$

$y \neq x$

d) $\frac{x^2-7x+1}{6-5x+x^2}$

$$\frac{x^2-7x+12}{6-5x+x^2}$$
$$=\frac{(x-4)(x-3)}{(x-3)(x-2)}$$
$$=\frac{x-4}{x-2}$$

$x \neq 3$ *and* $x \neq 2$

e) $\frac{x^2+5x+4}{(x+1)(x+2)(x-3)}$

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

$x \neq -1$, $x \neq -2$, *and* $x \neq 3$

f) $\frac{2(x+1)+2}{(2x+3)(x+1)-1}$

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

$x \neq -2$ *and* $x \neq -\frac{1}{2}$