# Solving Rational Equations

## Solve

$$\frac{4}{3x - 5} = 4$$

$$4 = 4(3x - 5)$$

$$4 = 12x - 20$$

$$24 = 12x$$

$$2 = x$$

$$\frac{4}{3(2) - 5}$$

$$= \frac{4}{6 - 5}$$

$$= \frac{4}{1}$$

$$= 4$$

Solve:

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

$$(x\neq1)\ \frac{x-5}{(x-4)(x+1)}=\frac{3x+2}{(x+1)(x-1)}\ (x\neq1)$$

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

$$x^2-6x+5=3x^2-10x-8$$

$$0=2x^2-4x-13$$

Can you factor?

$\otimes -26$

$\oplus -4$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{4\pm\sqrt{(-4)^2-4(2)(-13)}}{2(2)}$$

$$=\frac{4\pm\sqrt{120}}{4}$$

$$\sqrt{120}=\sqrt{4\times30}$$

$$=\frac{4\pm2\sqrt{30}}{4}$$

$$x=\frac{2+\sqrt{30}}{2}$$

$$x=\frac{2-\sqrt{30}}{2}$$

# Solving Rational Inequalities

$$\frac{2}{x-5} < 10$$

$$\frac{2}{x-5} - 10\frac{x-5}{x-5} < 0$$

$$\frac{2-10x+50}{x-5} < 0$$

$$\boxed{\frac{-10x+52}{x-5} < 0}$$

$V.A \to x = 5$

$H.A. \to \dfrac{-10x+52}{x-5}$

$\to y = -10$

$x\text{-int } (y=0)$

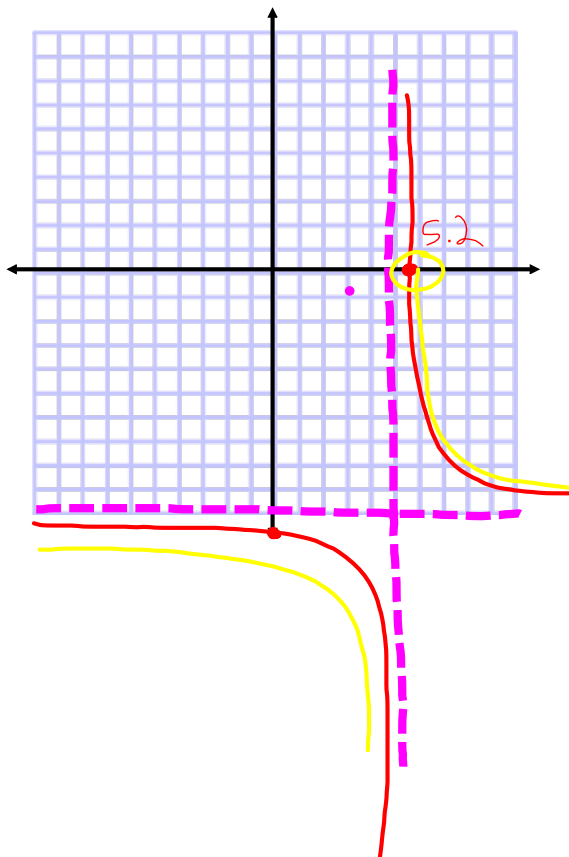$$0 = \frac{-10x+52}{x-5}$$

$0 = -10x + 52$

$10x = 52$

$x = 5.2$

$y\text{-int } (x=0)$

$y = -10.4$

5.2

$x \in (-\infty, 5) \text{ and } (5.2, \infty)$

$$\frac{x^2 - x - 2}{x^2 + x - 12} \geq 0$$

$$\frac{(x-2)(x+1)}{(x+4)(x-3)} \geq 0$$

$$\ast Key\ x\text{-}values \ast$$

$$2, -1, -4, 3$$

|  | $(-\infty, -4)$ | $-4$ | $(-4, -1)$ | $-1$ | $(-1, 2)$ | $2$ | $(2, 3)$ | $3$ | $(3, \infty)$ |
|---|---|---|---|---|---|---|---|---|---|
| $(x-2)$ | $-$ | $-$ | $-$ | $-$ | $-$ | $0$ | $+$ | $+$ | $+$ |
| $(x+1)$ | $-$ | $-$ | $-$ | $0$ | $+$ | $+$ | $+$ | $+$ | $+$ |
| $(x+4)$ | $-$ | $0$ | $+$ | $+$ | $+$ | $+$ | $+$ | $+$ | $+$ |
| $(x-3)$ | $-$ | $-$ | $-$ | $-$ | $-$ | $-$ | $-$ | $0$ | $+$ |
| $-(x)$ | $\frac{(-)(-)}{(-)(-)}$ $=+$ | $\frac{0}{0}$ Und | $-$ | $0$ | $+$ | $0$ | $-$ | Und | $+$ |

$$x \in (-\infty, -4) \cup [-1, 2] \cup (3, \infty)$$

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# 2, 3, 5, 9