Ex. 1 $|x-2| < 4$

$+(x-2) < 4$ $-(x-2) < 4$

$x - 2 < 4$ $x - 2 > -4$

$x < 6$ $x > -2$

$$-2 < x < 6$$

$$(-2, 6)$$

Ex. 2 $|3x - 4| \leq 6$

$3x - 4 \leq 6$ $3x - 4 \geq -6$

$3x \leq 10$ $3x \geq -2$

$x \leq \dfrac{10}{3}$ $x \geq -\dfrac{2}{3}$

$$\left[-\frac{2}{3}, \frac{10}{3}\right]$$

Ex. 3 $\dfrac{x-2}{x-4} > \dfrac{x-3}{x}$

$\dfrac{x(x-2)}{x(x-4)} > \dfrac{(x-3)(x-4)}{x(x-4)}$ $x \neq 0, 4$
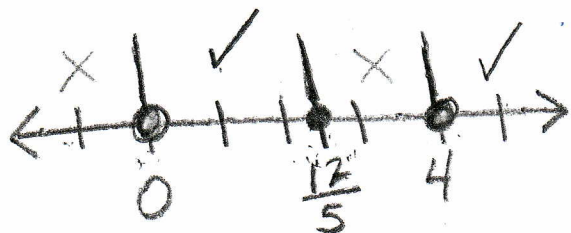
$\dfrac{x(x-2)}{x(x-4)} - \dfrac{(x-3)(x-4)}{x(x-4)} > 0$

$$\frac{(x^2-2x)-(x^2-7x+12)}{x(x-4)} > 0$$

$$\frac{5x-12}{x(x-4)} > 0$$

critical points:
numerator = 0 when $x = \frac{12}{5}$
denominator = 0 when $x = 0$ & 4

when $x = -1$: $\frac{-}{+}$ so < 0 doesn't work

when $x = 1$: $\frac{-}{-}$ so > 0 works ✓

when $x = 3$: $\frac{+}{-}$ so < 0 doesn't work
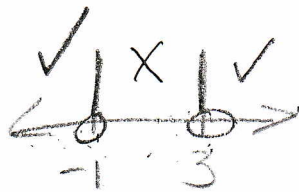
when $x = 5$: $\frac{+}{+}$ so > 0 works ✓

$0 < x < \frac{12}{5}$ and $x > 4$
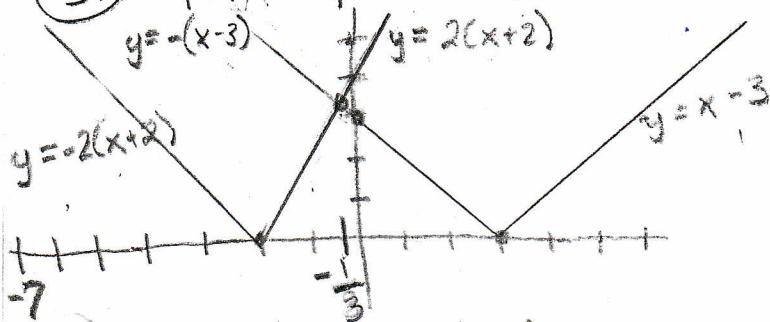
$$\left(0, \frac{12}{5}\right] \cup (4, \infty)$$

④

$x^2 - 2x - 3 > 0$

$(x-3)(x+1) > 0$

~~$-1 < x < 3$~~

~~$(-1, 3)$~~

$(-\infty, -1) \cup (3, \infty)$

⑤ $|x-3| < 2|x+2|$

$y = -(x-3)$ $y = 2(x+2)$

$y = -2(x+2)$

$y = x - 3$

-7

$-\frac{1}{3}$

intersection points:
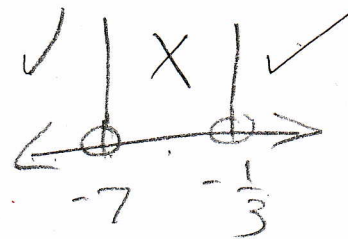
$-(x-3) = -2(x+2)$

$-x+3 = -2x-4$

$x = -7$

$-(x-3) = 2(x+2)$

$-x+3 = 2x+4$

$-1 = 3x$

$-\frac{1}{3} = x$

-7 $-\frac{1}{3}$

graph of $y = |x-3|$ is below the graph

of $y = 2|x+2|$ when $x < -7$ and $x > -\frac{1}{3}$

$(-\infty, -7) \cup \left(-\frac{1}{3}, \infty\right)$