Use a sign chart to solve each of the following inequalities. Write your answers in interval notation.

Quadratic Inequalities

Answers

1. $x^2 - x - 6 \geq 0$ $\quad (-\infty, -2] \cup [3, \infty)$

2. $2x^2 + 5x - 3 < 0$

3. $5x + 6 \geq x^2$ $\quad [-1, 6]$

4. $x^2 - 2x < 0$ $\quad (0, 2)$

5. $2x^2 + x \geq 1$ $\quad (-\infty, -1] \cup [\frac{1}{2}, \infty)$

Rational Inequalities

6. $\dfrac{x+3}{x-2} \geq 0$ $\quad (-\infty, -3] \cup (2, \infty)$

7. $\dfrac{4-x}{x-3} < 0$ $\quad (3, 4)$

8. $\dfrac{2x+3}{1-x} \geq 0$ $\quad [-\frac{3}{2}, 1)$

9. $\dfrac{x^2}{x-2} > 0$ $\quad (2, \infty)$

10. $\dfrac{3x+4}{x-1} < 1$ $\quad (-\frac{5}{2}, 1)$

1. $x^2 - x - 6 \geq 0$

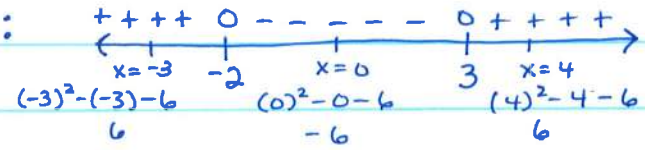
Find zeros (critical values): $x^2 - x - 6 = 0$

$(x-3)(x+2) = 0$

$x - 3 = 0 \quad x + 2 = 0$

$x = 3 \quad x = -2$

Sign chart:



$\boxed{(-\infty, -2] \cup [3, \infty)}$

2. $2x^2 + 5x - 3 < 0$

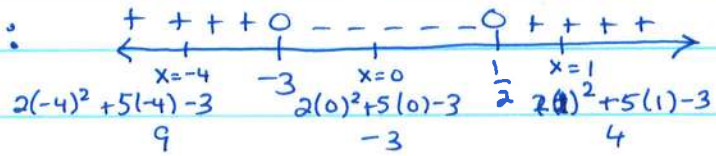
Find zeros (critical values): $2x^2 + 5x - 3 = 0$

$(2x - 1)(x + 3) = 0$

$2x - 1 = 0 \quad x + 3 = 0$

$x = \frac{1}{2} \quad x = -3$

Sign chart:



$\boxed{(-3, \frac{1}{2})}$

3. $5x + 6 \geq x^2$

$0 \geq x^2 - 5x - 6$ or $x^2 - 5x - 6 \leq 0$

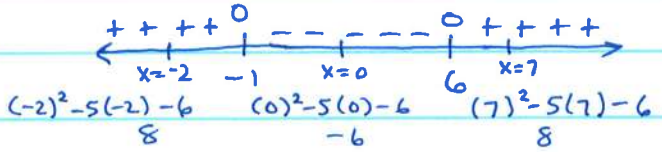
Find zeros (critical values): $x^2 - 5x - 6 = 0$

$(x - 6)(x + 1) = 0$

$x - 6 = 0 \quad x + 1 = 0$

$x = 6 \quad x = -1$

Sign chart:



$\boxed{[-1, 6]}$

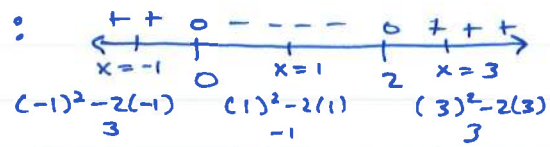
4. $x^2 - 2x < 0$

Find zeros (critical values) : $x^2 - 2x = 0$

$x(x-2) = 0$

$x = 0,\ x = 2$

Sign chart :



$\boxed{(0, 2)}$

5. $2x^2 + x \geq 1$

$2x^2 + x - 1 \geq 0$

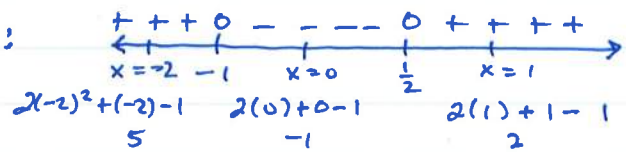
Find zeros (Critical values): $2x^2 + x - 1 = 0$

$(2x-1)(x+1) = 0$

$2x - 1 = 0 \qquad x + 1 = 0$

$x = \frac{1}{2} \qquad x = -1$

Sign Chart:



$\boxed{(-\infty, -1] \cup [\frac{1}{2}, \infty)}$

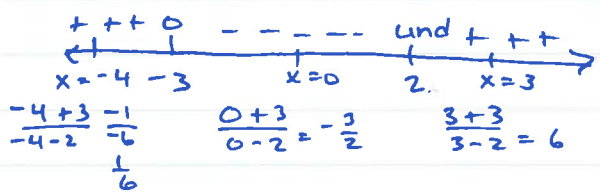
6. $\frac{x+3}{x-2} \geq 0$

Critical values : $x + 3 = 0 \qquad x - 2 = 0$

$x = -3 \qquad x = 2$

(zero) (undefined)

Sign chart:



$\boxed{(-\infty, -3] \cup (2, \infty)}$

8. $\frac{2x+3}{1-x} \geq 0$

Critical Values: $2x+3=0$ $\quad$ $1-x=0$

$x = \frac{-3}{2}$ $\quad$ $x=1$

(zero) $\quad$ (undefined)

Sign chart:

$- - - 0 + + + + \text{und.} - - - -$

$x=-2$ $\quad$ $-\frac{3}{2}$ $\quad$ $x=0$ $\quad$ 1 $\quad$ $x=2$

$\frac{2(-2)+3}{1-(-2)} = \frac{-1}{3}$ $\quad$ $\frac{2(0)+3}{1-0} = 3$ $\quad$ $\frac{2(2)+3}{1-2} = \frac{7}{-1}$

$\boxed{\left[\frac{-3}{2}, 1\right)}$

9. $\frac{x^2}{x-2} > 0$

critical values: $x^2 = 0$ $\quad$ $x-2=0$

$x=0$ $\quad$ $x=2$

(zero) $\quad$ (undefined)

sign chart:

$- - - - 0 - - - - \text{und} + + +$

$x=-1$ $\quad$ 0 $\quad$ $x=1$ $\quad$ 2 $\quad$ $x=3$

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

$\boxed{(2, \infty)}$

10. $\frac{3x+4}{x-1} < 1$

$\frac{3x+4}{x-1} - 1 < 0$

$\frac{3x+4}{x-1} - \frac{x-1}{x-1} < 0$ $\quad$ $\frac{2x+5}{x-1} < 0$

Critical values: $2x+5=0$ $\quad$ $x-1=0$

$x = \frac{-5}{2}$ $\quad$ $x=1$

(zero) $\quad$ (undefined)

Sign chart:

$+ + + 0 - - - - \text{und} + + +$

$x=-3$ $\quad$ $-\frac{5}{2}$ $\quad$ $x=0$ $\quad$ 1 $\quad$ $x=2$

$\frac{2(-3)+5}{-3-1} = \frac{-1}{-4}$ $\quad$ $\frac{2(0)+5}{0-1} = \frac{5}{-1}$ $\quad$ $\frac{2(2)+5}{2-1} = 14$

$\boxed{\left(\frac{-5}{2}, 1\right)}$