

Chapter 9 Extra Practice

1. Solve the following Linear Inequalities:

a) $3x + 5 \leq 5x - 1$

$3x - 5x \leq -1 - 5$

$-2x \leq -6$

$x \geq 3$

b) $3 - 2(x - 4) > 4x + 5$

$3 - 2x + 8 > 4x + 5$

$-2x - 4x > 5 - 3 - 8$

$-6x > -6$

$x < 1$

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

$\frac{1}{4}x - \frac{3}{4} \geq 2x - 1$

$x - 3 \geq 8x - 4$

$-7x \geq -1$

$x \leq \frac{1}{7}$

d) $\frac{3x+1}{2} \leq \frac{5(2x-3)}{3}$

$3(3x+1) \leq 10(2x-3)$ $\leftarrow \times 2 \times 3$

$9x + 3 \leq 20x - 30$

$9x - 20x \leq -30 - 3$

$-11x \leq -33$

$-11x \leq -33$

$x \geq 3$

e) $4(x - 3) < 3(2x + 1)$

$4x - 12 < 6x + 3$

$-2x < 15$

$x > -\frac{15}{2}$

f) $5(2x + 1) \geq \frac{2}{3}(x + 4)$

$10x + 5 \geq \frac{2}{3}x + \frac{8}{3}$

$30x + 15 \geq 2x + 8$

$28x \geq -7$

$x \geq -\frac{1}{4}$

2. Solve the following Quadratic Inequalities:

a) $x^2 + x - 6 \geq 0$

zeros: -3 and 2 

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

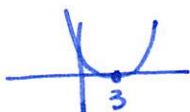
b) $2x^2 - 5x - 3 < 0$

zeros: $-\frac{1}{2}$ and 3 

$-\frac{1}{2} < x < 3$

c) $x^2 - 6x + 9 \leq 0$

$(x - 3)^2 \leq 0$



$x = 3$

d) $6x^2 + x \geq 1$

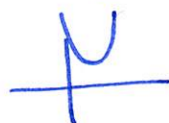
$6x^2 + x - 1 \geq 0$

zeros: $-\frac{1}{2}$ and $\frac{1}{3}$ 

$x \leq -\frac{1}{2}$ or $x \geq \frac{1}{3}$

e) $x^2 - 2x + 4 \geq 0$

zeros: $\Delta = 4 - 4(4) = -12 < 0$
none!



$x \in \mathbb{R}$

f) $2x^2 + 6x + 4 \leq 0$

$2(x+2)(x+1) < 0$

zeros: -2 and -1 

$-2 \leq x \leq -1$

3. Solve the following Inequalities:

a) $\frac{x^2-x-6}{x+1} \geq 0$

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

| | | | | | | |
|-----|----|----|----|---|----|---|
| x | -∞ | -2 | -1 | 3 | +∞ | |
| x+2 | - | 0 | + | + | + | |
| x-3 | - | - | - | 0 | + | |
| x+1 | - | - | 0 | + | + | |
| A | - | 0 | + | - | 0 | + |

sol: $[-2, -1[\cup [3, +\infty[$

b) $\frac{x^2-2x-3}{x^2-2x-8} \leq 0$

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

| | | | | | | | |
|-----|----|----|----|---|---|----|---|
| x | -∞ | -2 | -1 | 3 | 4 | +∞ | |
| x-3 | - | - | - | 0 | + | + | |
| x+1 | - | - | 0 | + | + | + | |
| x+2 | - | 0 | + | + | + | + | |
| x-4 | - | - | - | - | 0 | + | |
| A | + | - | 0 | + | 0 | - | + |

sol: $[-2, -1] \cup [3, 4[$

c) $\frac{x-5}{x^2-2x-3} > 0$

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

| | | | | | | |
|-----|----|----|---|---|----|---|
| x | -∞ | -1 | 3 | 5 | +∞ | |
| x-5 | - | - | - | 0 | + | |
| x+1 | - | 0 | + | + | + | |
| x-3 | - | - | 0 | + | + | |
| A | - | - | + | - | 0 | + |

sol: $]-1, 3[\cup]5, +\infty[$

d) $\frac{x^2-3x}{x^2+x} \leq 0$

$$A = \frac{x(x-3)}{x(x+1)}$$

| | | | | | |
|-----|----|----|---|---|----|
| x | -∞ | -1 | 0 | 3 | +∞ |
| x | - | - | 0 | + | + |
| x-3 | - | - | - | 0 | + |
| x | - | - | 0 | + | + |
| x+1 | - | 0 | + | + | + |
| A | + | - | - | 0 | + |

sol: $]-1, 0[\cup]0, 3]$

e) $\frac{x^2-9}{x+3} < 0$

$$A = \frac{(x+3)(x-3)}{x+3}$$

| | | | | |
|-----|----|----|---|----|
| x | -∞ | -3 | 3 | +∞ |
| x+3 | - | 0 | + | + |
| x-3 | - | - | 0 | + |
| x+3 | - | 0 | + | + |
| A | - | - | 0 | + |

sol: $]-\infty, -3[\cup]-3, 3]$

4. Test to see if the given values are solutions for the given inequalities:

a) $x = 0$ for $\frac{4x+3}{x+1} > 5x + 3$

$$\frac{3}{3} \quad \Bigg| \quad 3$$

no!

b) $x = -2$

for $2x^3 - 5x^2 + 1 > x + 4$

$$\frac{2(-2)^3 - 5(-2)^2 + 1}{-16 - 20 + 1} \quad \Bigg| \quad \frac{-2 + 4}{2}$$

no!

c) $x = -3$ for $-x^2 + 5x + 24 \geq 0$

$$\frac{-(-3)^2 + 5(-3) + 24}{-9 - 15 + 24} \quad \Bigg| \quad 0$$

yes!

d) $x = -1$

for $-3x^3 - 4x^2 + 5x > 1$

$$\frac{-3(-1)^3 - 4(-1)^2 + 5(-1)}{3 - 4 - 5} \quad \Bigg| \quad 1$$

no!