

Assignment 4

1. Let a , b and c be real numbers with $a < c$ and $|c| < |a| < |b|$.

Determine whether each of the following inequalities is true or not. Explain your answer.

(a) $\frac{a}{c^2-b^2} < \frac{c}{c^2-a^2}$

(b) $a < \frac{b^2-c^2}{a-c} - c$

2. Find the solution set for each of following inequalities.

(a)

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

(b)

$$-\frac{1}{x} \leq 8x^2$$

(c)

$$\frac{|x+3|}{x} (3 - |x+3|) > \frac{2}{x}.$$

(d)

$$\frac{-x^2 + |x| - 3}{-x^4 + x^2 - x + 2 + |x^4 + 1|} \leq 0$$

(e)

$$\frac{2^x(2 - \sin(x))(x^3 - 1)}{x^5 - 4x^3 - x^2 + 4} \leq 0$$

Hint: $|\sin(x)| \leq 1$

(f) (Optional)

$$\frac{|2x+5|}{3|x|-1} \leq 1 - \frac{2}{1-3|x|}$$

3. (Optional) Find the solution set for each of the following inequities.

(a) $\frac{x-1}{x+1} \leq 0$

(b) $\frac{-x^2-x}{2-x} \geq 0$

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

(d) $\frac{(2x^2+4x+7)(x-1)}{x^3-5x^2+x-5} \leq 0$

(e) $\frac{x^2+8}{x^2+x+6} \geq 0$

(f) $\frac{x^2-2x-4}{x^2-x-6} \geq 0$

(g) $\frac{2x-x^2-3}{x-2x^2-1} \leq 1$

- (h) $\frac{(-x^2+5x-7)(2x+1)}{x^4-1} \geq 0$
- (i) $\frac{x^2-1}{2-3x+x^2} > \frac{1}{x}$
- (j) $\frac{x^4+6x^2}{1-2x} \leq x^2$
- (k) $x^5 + 3x^4 - 23x^3 - 51x^2 + 94x + 120 \geq 0$
- (l) $\frac{\ln(x^2+x+4)}{|\sin(x)-\cos(x)|-3} < 0$

4. (Optional) Find the solution set for each of the following inequities.

- (a) $|x - 1| < 7$
- (b) $3 < |x + 2| < 4$
- (c) $|2x + 3| \leq 2$
- (d) $|3x - 1| \geq 1$
- (e) $\frac{|x+2|}{2} > |x|$
- (f) $|x + 1| - |2x - 1| < 0$
- (g) $|2 - x| - x \leq 0$
- (h) $|x + 1| > 3 - |x|$
- (i) $x^2 - 2 \geq \frac{1}{2}|x - 1|$
- (j) $|x + 3| \geq 2 - x$
- (k) $|2x^2 + x - 1| \geq 2$
- (l) $\frac{|x|}{2} + 3 > x^2$
- (m) $|x| > \frac{2}{|x+1|}$
- (n) $\frac{x^2}{x+1} < |x|$
- (o) $\frac{4}{|x|} \leq \frac{1}{|x|}$
- (p) $|x^2 + 1| < |x + 1|$
- (q) $(x^2 + 1)(|x + 2| - |x|) \geq 0$
- (r) $\frac{|1-x|}{x^3+2x^2+5x+4} \leq 0$