

1.4 Solving Inequalities

The ability to **solve inequalities** will be required later in the course when we do detailed study of the graphs of functions.

Linear Inequalities in One Variable

Ex.1 Solve the following and write your solution in interval notation.

$$5 - \frac{3}{5}(2x - 1) \geq \frac{1}{2}x - 8$$

$$(10) 5 - (10) \frac{3}{5}(2x - 1) \geq (10) \frac{1}{2}x - (10) 8$$

$$50 - 6(2x - 1) \geq 5x - 80$$

$$50 - 12x + 6 \geq 5x - 80$$

$$\frac{-17x}{-17} \geq \frac{-136}{-17}$$

$$x \leq 8$$

$$(-\infty, 8]$$

Solving Double Linear Inequalities In One Variable

Ex.2 Solve the following and write your solution in interval notation.

$$-9 < 5 - \frac{7}{4}x < 26$$

$$-36 < 20 - 7x < 104$$

$$\frac{-56}{-7} < \frac{-7x}{-7} < \frac{84}{-7}$$

$$(-12, 8)$$

$$8 > x > -12$$

$$-12 < x < 8$$

Ex.3 Solve the following and write your solution in interval notation.

$$\frac{1}{6} \leq \frac{2}{x+1} \leq \frac{1}{2}$$



**Remember
restrictions!**

$$x \neq -1$$

$$6 \geq \frac{x+1}{2} \geq 2$$

$$12 \geq x+1 \geq 4$$

$$11 \geq x \geq 3$$

$$3 \leq x \leq 11$$

$$[3, 11]$$

Ex.4 Solve the following and write your solution in interval notation.

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



Remember restrictions!

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

$$x \neq \frac{1}{2}$$

$$-3 \geq 2(1-2x) \geq -18$$

$$-3 \geq 2-4x \geq -18$$

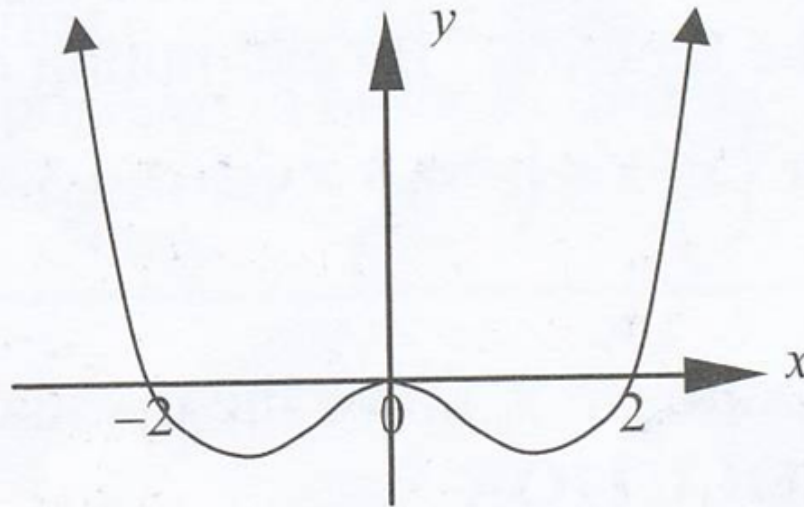
$$-5 \geq -4x \geq -20$$

$$\frac{5}{4} \leq x \leq 5$$

$$\left[\frac{5}{4}, 5 \right]$$

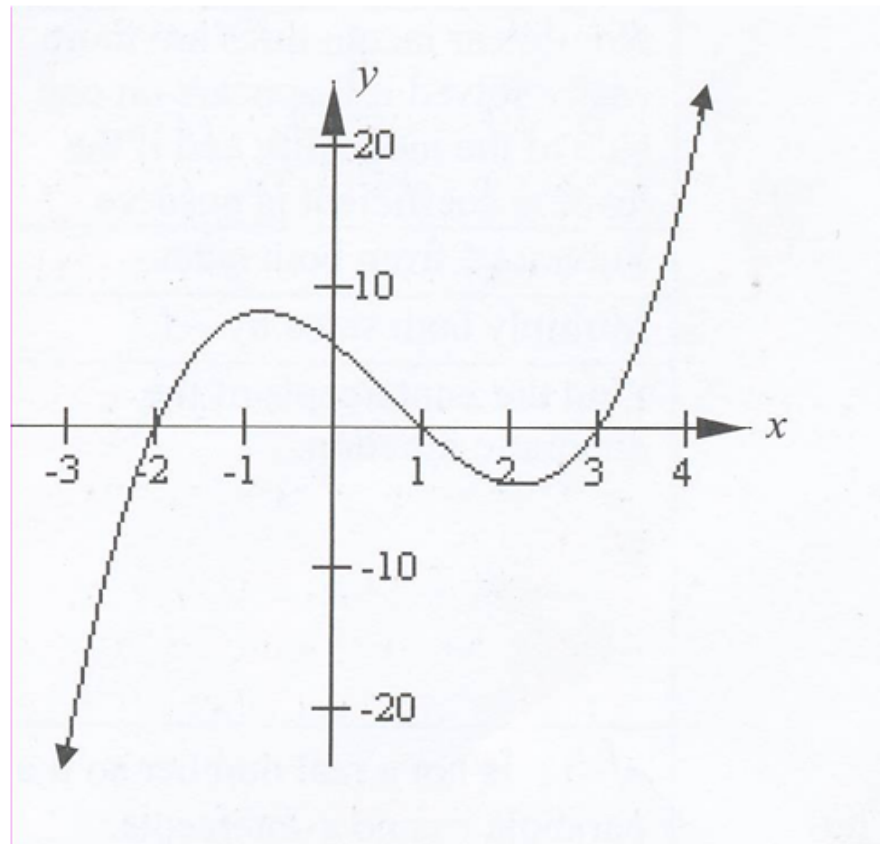
Graphical Solutions of Inequalities

Examine the sketch of the function $y = f(x)$ below and determine the values of x for which $f(x) > 0$



$$(-\infty, -2) \cup (2, \infty)$$

Example 5. Examine the graph of $y = x^3 - 2x^2 - 5x + 6$ shown at right and determine the values of x for which (a) $x^3 - 2x^2 - 5x + 6 > 0$, (b) $x^3 - 2x^2 - 5x + 6 < 0$, and (c) $x^3 - 2x^2 - 5x + 6 = 0$.



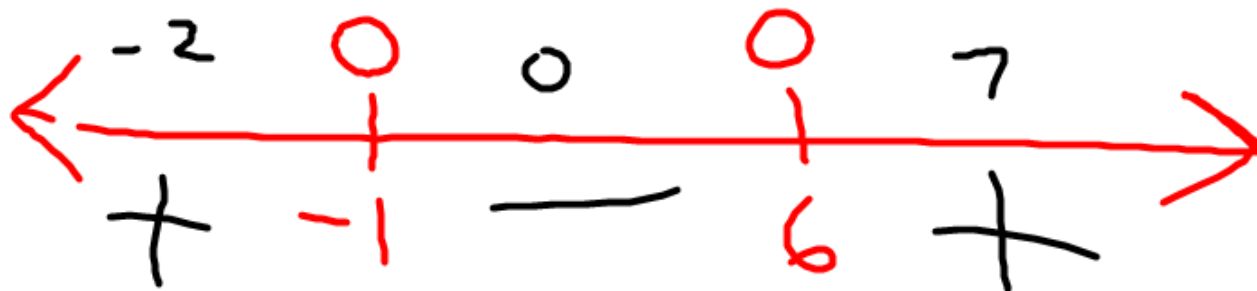
Ex.6 Solve each inequality, write your answer in interval notation.

$$\text{a) } x^2 \geq 5x + 6$$

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

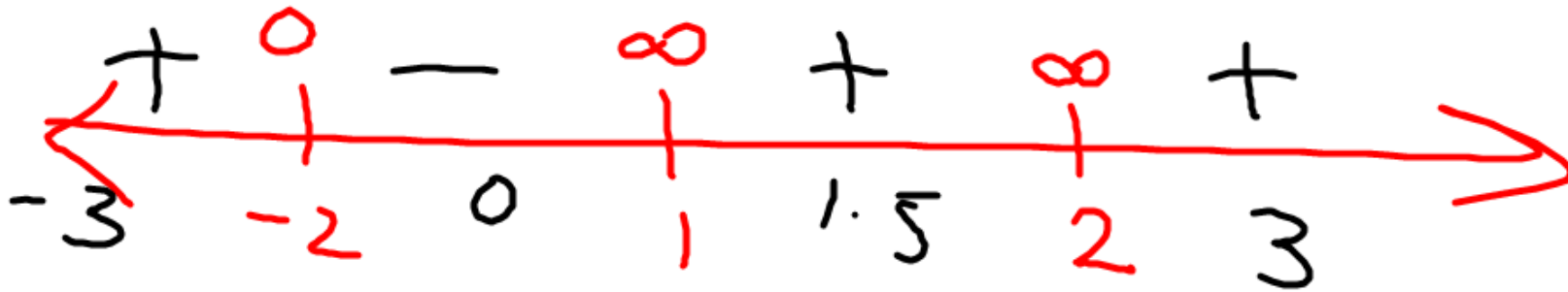
$$(x-6)(x+1) \geq 0$$

$$(-\infty, -1] \cup [6, \infty)$$



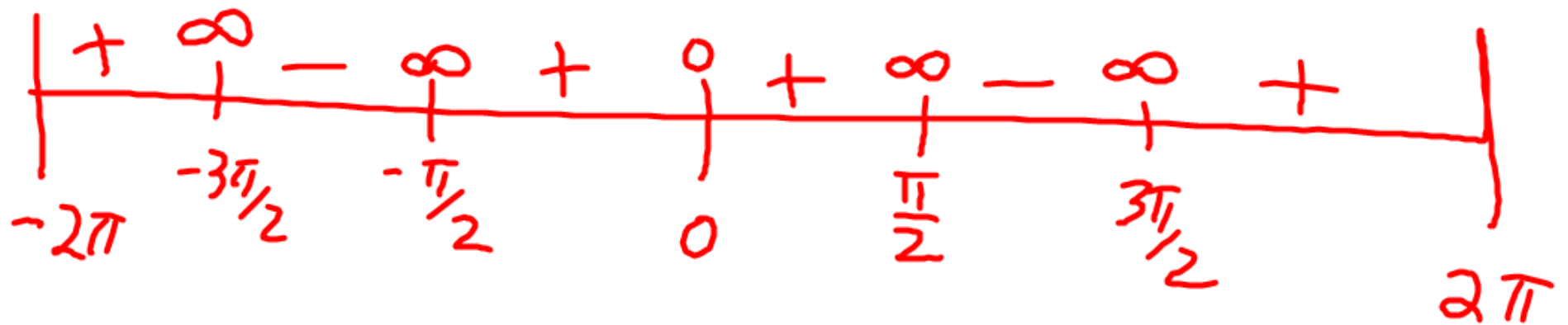
$$\text{b) } \frac{x^2 - 4}{x^2 - 3x + 2} < 0$$

$$\frac{\cancel{(x-2)}(x+2)}{\cancel{(x-2)}(x-1)} < 0$$

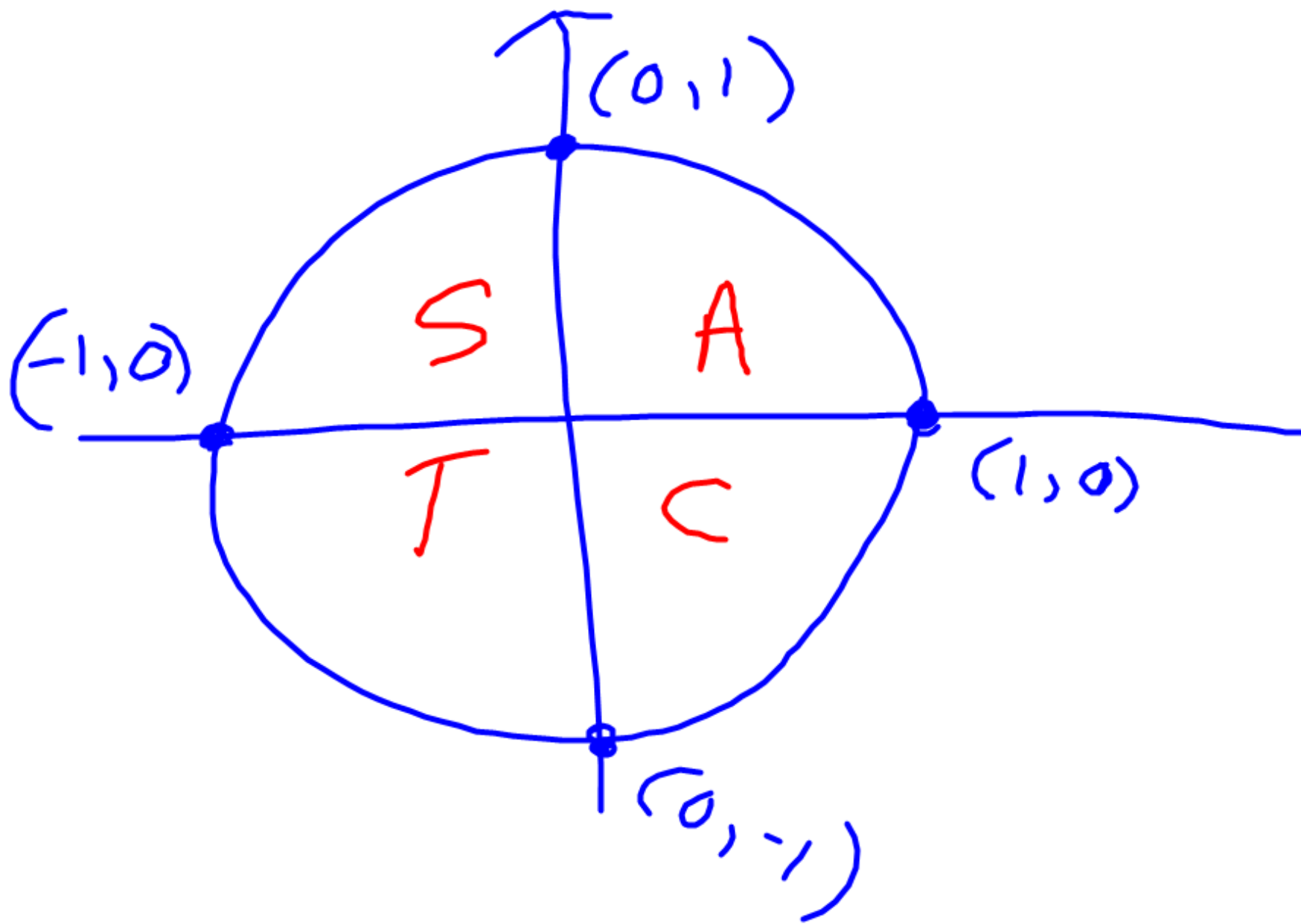


$$[-2, 1)$$

$$\text{c) } \frac{x^2}{\cos x} \geq 0 \text{ for } x \in [-2\pi, 2\pi]$$



$$[-2\pi, -3\pi/2) \cup (-\pi/2, \pi/2) \cup (3\pi/2, 2\pi]$$



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1,3,5,6,7,8,11,12,14,15,16,17,18