Practice Problems 2!

Q.1. $4x + 15 < 23$

$4x < 8$

$x < 2$

Q.2. $x^2 - 3 > 25$

$x^2 > 28$

$x < -\sqrt{28}$ or $x > \sqrt{28}$

Only positive values allowed.

$\therefore \quad x > \sqrt{28}$

$\therefore \quad x \in (\sqrt{28}, \infty)$

3) If $-7 \leq x < 6$ & $-5 \leq y \leq 8$

Max & min of xy.

-ve xy -56 $(x=-7, y=8)$

+ve xy 48 $(x=6, y=8)$

4) $5y + 13 \geq -7y + 13$

$12y \geq 10$

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$y \geq \frac{10}{12}$

5) $|r| < 1$ $\quad a = 5(1-r)$.

$-1 < r < 1$

$1 > -r > -1$

$2 > 1-r > 0$

$10 > 5(1-r) > 0$

$10 > a > 0$

$0 < a < 10$

6) $b^2 - 4ac = 36 - 48 = -12$

If $\underset{\Delta}{\det} < 0$, complex.

for real & distinct $\Delta > 0$

real & coinciding $\Delta = 0$

complex $\Delta < 0$

7) $b^2 - 4ac = 100 - 4 \times 5 \times 20 = 100 - 400 = -300 < 0$

If $\Delta < 0$, complex.

8) $ax^2 + bx + c = 0$ for quadratic equation.

where $a \neq 0$.

d) $\Rightarrow x^2 - 4 = 0$

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

$x^2 - 2x - 1x + 2 = x^2 + x$

$-3x + 2 = x$

$2 = 4x$

$x = 2$

$\therefore$ It is a linear equation.

10) roots are 1 and -3.

Any quadratic equation with roots α & β can be expressed as:

$(x-\alpha)(x-\beta) = 0$

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

$x^2 - x + 3x - 3 = 0$

$x^2 + 2x - 3 = 0$

11) $|2x-5| > |x+1|$. Solve.

$2x - 5 > 0$ $\qquad x + 1 > 0$

$x > 5/2$ $\qquad x > -1$

$2x - 5 > x + 1$

$x > 6$

11) * $|2x-5| > |x+1|$

→ $2x-5 > x+1$

$-2x+5 > x+1$

$2x-5 > -1-x$

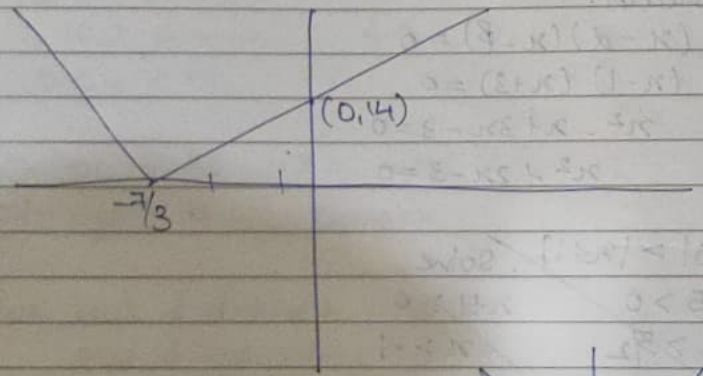
$-2x+5 > -1-x$

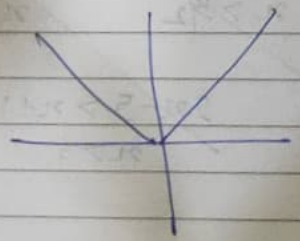
12) * $f(x) = 2|3x+7|$

$f(x) = 2(3x+7)$ $\quad 3x+7 \geq 0$ $\quad x \geq -7/3$

$f(x) = -2(3x+7)$ $\quad 3x+7 < 0$ $\quad x < -7/3$

$$f(x) = \begin{cases} 6x+14 & x \geq -7/3 \\ -6x-14 & x < -7/3 \end{cases}$$





13) $4x^2 - 4x - 3$

factorization

$4x^2 - 6x + 2x - 3 = 0$

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

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

$\therefore x = \frac{-1}{2}$ or $x = \frac{3}{2}$

formula - $\frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{4 \pm \sqrt{16+48}}{8}$

$= \frac{4 \pm 8}{8}$

$= \frac{3}{2}$ or $\frac{-1}{2}$

completion of squares

$4x^2 - 4x - 3 = 0$

$x^2 - x - 3/4 = 0$

$x^2 - 2 \cdot x \cdot 1/2 - 3/4 = 0$

$x^2 - 2x \cdot 1/2 + (1/2)^2 - (1/2)^2 - 3/4 = 0$

$(x - 1/2)^2 - 1 = 0$

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

$x = 3/2$

14) let the nos. be x & y.

$\therefore xy = 91$ $\quad x - y = 6 \Rightarrow x = y + 6$

$y(y+6) = 91$

$y^2 + 6y - 91 = 0$

$y^2 + 13y - 7y - 91 = 0$

$y(y+13) - 7(y+13) = 0$

$(y-7)(y+13) = 0$

$\therefore y = 7$ or -13

$\therefore x = 13$ or -7

15) Quadratic Inequality

$x^2 - 6x - 16 \leq 0$

$x^2 - 6x + 9 - 9 - 16 \leq 0$

$(x-3)^2 - 25 \leq 0$

$(x-3)^2 \leq 25$

$-25 \leq x-3 \leq 5$

$-2 \leq x \leq 8$

16) $x^4 + 2x^2 - 3 = 0$. Solve for real values.

let $x^2 = t$.

$\therefore t^2 + 2t - 3 = 0$.

$t^2 + 3t - t - 3 = 0$.

$t(t+3) - 1(t+3) = 0$.

$(t-1)(t+3) = 0$.

$\therefore t = 1$ or $t = -3$

$\therefore x^2 = -3, 1$

$x^2 \neq -3$. : real values.

$\therefore x = \pm 1$

17) a) $\frac{1}{x^2+2x-8} > 0$.

$\frac{1}{x^2+4x-2x-8} > 0$

$\frac{1}{x(x+4)-2(x+4)} > 0$

$\frac{1}{(x-2)(x+4)} > 0$.

$\therefore x-2 > 0$ or $x+4 > 0$

$\therefore x > 2$ & $x > -4 \Rightarrow x > 2$

II. $x-2 < 0$ $\quad x+4 < 0$

$x < 2$ $\quad x < -4 \rightarrow x < -4$.