The University of Calgary
Department of Mathematics and Statistics
MATH 249-01
Quiz #1R

Fall 2007

Name:_____**I.D.#:**_____

EXPLAIN ALL STEPS!

1. Solve for x:
   $|3x+1| \leq |1-x|$ [4]

2. Solve for x $\quad \dfrac{2}{x+5} \leq \dfrac{1}{4}$. [4]

3. Find an equation of the line perpendicular to $3x+6y=1$ passing through the centre of the circle $x^2+y^2-3y=11$. [4]

4. Simplify and find the restriction on x: $\quad \dfrac{x}{x^2-x-2} - \dfrac{1}{x+1}$. [3]

SOLUTION

For 1)

square both sides $\quad (3x+1)^2 \leq (x-1)^2$

$9x^2+6x+1 \leq x^2-2x+1 \qquad 8x^2+8x \leq 0$

$8x\,(x+1) \leq 0$ parabola open up with two roots

$x=0$ and $x=-1$ negative between $x \in [-1,0]\,.$

For 2)

for $x \neq -5 \qquad \dfrac{2}{x+5} - \dfrac{1}{4} \leq 0 \qquad \dfrac{8-(x+5)}{4\,(x+5)} \leq 0$

$\dfrac{3-x}{4(x+5)} \leq 0 \qquad$ split points $x=-5,3$

testing $\quad -\,-^{neg}\,-_{x=-6}\,-\,-_{-5}\,-\,-^{pos}\,-_{x=0}\,-\,-_{3}\,-\,-^{neg}\,-_{x=4}-$

so $\quad x \in (-\infty,-5) \cup [3,+\infty)\,.$

For 3)

complete the square $\quad x^2+y^2-2\cdot\frac{3}{2}y+\left(\frac{3}{2}\right)^2 = 11+\frac{9}{4}$

$x^2+\left(y-\frac{3}{2}\right)^2 = \frac{53}{4}$ so the centre is $C\left(0,\frac{3}{2}\right)$

so a line passing through $C \qquad y = m_1 x + \frac{3}{2}$

and the slope $m_1 = \frac{-1}{m}$ where $m = -\dfrac{1}{2}$ is the slope of $3x+6y=1$

therefore $y = 2x + \frac{3}{2}$ or $2y - 4x = 3$

For 4)

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

for $x \neq -1, 2$.