The University of Calgary
Department of Mathematics and Statistics
MATH 249/01
Quiz # 1W

Fall 2007

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

EXPLAIN ALL STEPS!

1. Solve for x: $\dfrac{3+x}{6} \geq \dfrac{3}{1-x}$. [4].
2. Solve for x: $|2x+3| \geq 1$. [4]
3. Find an equation of the line parallel to the line $3x-2y=1$ passing through the center of the circle $x^2+4x+y^2-y=0$. [4]
4. Simplify and find the restriction on x: $\dfrac{x}{\dfrac{x}{1-x}-2}$. [3]

SOLUTION

For 1)

for $x \neq 1$ $\quad \dfrac{3+x}{6} - \dfrac{3}{1-x} \geq 0 \quad \dfrac{(3+x)(1-x)-18}{6(1-x)} \geq 0$

$\dfrac{3+x-3x-x^2-18}{6(1-x)} \geq 0 \quad \dfrac{-x^2-2x-15}{6(1-x)} \geq 0$

multitply by -1 $\quad \dfrac{x^2+2x+15}{6(1-x)} \leq 0$

the top is always positive since the discr.$D = 4 - 4 \cdot 15 = -56$ negative,
no real roots,parabola open up,always above the x-axis
thus the bottom must be negative $\quad x > 1$

Or split points "$\dfrac{0}{0}$" only $x = 1$

testing

$-_{x=0}\ -^{pos}\ -\ -_{1}\ -_{x=2}\ -^{neg}\ --$

check the split point,then the solution is $\quad x \in (1, +\infty)$

For 2)

$|2x+3| \geq 1 \quad \left|x - \left(-\frac{3}{2}\right)\right| \geq \frac{1}{2}$ distance to $\frac{-3}{2}$ must be equal to or bigger than $\frac{1}{2}$

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

OR square both sides $\quad 4x^2+12x+9 \geq 1 \quad 4(x^2+3x+2) \geq 0$

$(x+1)(x+2) \geq 0$ parabola open up with

$x = -2, -1$ split points=roots

testing

$-\ -^{pos}\ -_{x=-3}\ -\ -_{-2}\ -_{x=-\frac{3}{2}}\ -^{neg}\ -\ -_{-1}\ -_{x=0}\ -^{pos}\ --$

$x \in (-\infty, -2] \cup [-1, +\infty)$

.

For 3)

the slope of the given line $3x - 2y = 1 \qquad y = \frac{3}{2}x - \frac{1}{2}$ is $m = \frac{3}{2}$

for the center complete the square

$x^2 + 4x + 4 + y^2 - 2 \cdot \frac{1}{2}y + \left(\frac{1}{2}\right)^2 = 4 + \frac{1}{4}$

$(x+2)^2 + \left(y - \frac{1}{2}\right)^2 = \frac{17}{4}$ so the center is at $\left(-2, \frac{1}{2}\right)$,

parallel line has the same slope

$y - \frac{1}{2} = \frac{3}{2}(x+2) \qquad y = \frac{3}{2}x + \frac{7}{2} \qquad 2y - 3x = 7.$

For 4)

for $x \neq 1 \qquad \dfrac{x}{\dfrac{x}{1-x} - 2} = \dfrac{x}{\dfrac{x - 2(1-x)}{1-x}} = x \cdot \dfrac{1-x}{3x-2} = \dfrac{x(1-x)}{(3x-2)}$

and for $x \neq \frac{2}{3}$.