l**The University of Calgary**
Department of Mathematics and Statistics
MATH 249-01
Quiz # 1W

Fall 2008

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

1. Solve for x:
   (a) $\dfrac{8}{x} \geq \dfrac{x+10}{x+1}$
   (b) $|2x+3| > -1$. [4]

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

3. Simplify and find all x for which the expressions are defined
$$\frac{x-3}{1+\dfrac{6x}{x^2+9}}.$$ [3]

Solution
For 1a)
for $x \neq -1$ $\quad \dfrac{8}{x} - \dfrac{10+x}{x+1} \geq 0 \quad \dfrac{8(x+1) - x(10+x)}{x(x+1)} \geq 0 \quad \dfrac{8x+8-10x-x^2}{x(x+1)} \geq 0$
$\dfrac{8-2x-x^2}{x(x+1)} \geq 0 \quad \dfrac{x^2+2x-8}{x(x+1)} \leq 0 \quad \dfrac{(x+4)(x-2)}{x(x+1)} \leq 0$ split points $\quad x = 0, -1, -4, 2$
testing $\overset{pos}{\underset{x=-5}{\frown}} -4 \overset{neg}{\underset{x=-2}{-}} -1 \underset{x=-\frac{1}{2}}{-} \overset{pos}{-} 0 \overset{neg}{-} \underset{x=1}{-} - 2 \overset{pos}{\underset{x=4}{-}}$
check the split points $\quad x = 0, -1$ No; $\quad x = -4, 2$ O.K.
so $x \in [-4, -1) \cup (0, 2]$
For 1b)
always $|...| \geq 0$ so bigger than neg# $\quad (-\infty, +\infty) \quad$ any x
For 2)
the line $3x - 4y = 4 \quad y = \frac{3}{4}x - 1$ has the slope $m = \dfrac{3}{4}$
so the perpendicular line has to have slope $\quad m_\perp = -\dfrac{4}{3}$
to find the center complete the square
$x^2 + y^2 - 2 \cdot \dfrac{1}{2}y + \dfrac{1}{4} = 1 + \dfrac{1}{4} \quad x^2 + (y - \dfrac{1}{2})^2 = \dfrac{5}{4} \quad C(0, \dfrac{1}{2})$
and together $\quad y = -\dfrac{4}{3}x + \dfrac{1}{2}$.
For 3)
$$\frac{x-3}{1+\dfrac{6x}{x^2+9}} = \frac{x-3}{\dfrac{x^2+9+6x}{x^2+9}} = \frac{x-3}{\dfrac{(x+3)^2}{x^2+9}} = \frac{(x-3)(x^2+9)}{(x+3)^2} \quad \text{for } x \neq -3 \text{ only.}$$