The University of Calgary
Department of Mathematics and Statistics
MATH 249-02 Quiz #1F Winter 2011

1. Solve for x: $|3x-1| > |1+x|$ [2]

2. Solve for x $\dfrac{4}{2x+3} \leq 1-2x.$ [3]

3. Find an equation of the line parallel to $3x+6y=1$ passing through the centre of the circle $x^2+y^2-8y=0.$ [3]

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

SOLUTION For 1)

since both sides are positive or 0 we can square both sides

$(3x-1)^2 > (1+x)^2$

$9x^2-6x+1 > x^2+2x+1 \rightarrow 8x^2-8x > 0 \rightarrow 8x(x-1) > 0$

parabola open up with two roots:$x=0,1$; negative between roots.

positive for $x<0$ OR $x>1$ $x \in (-\infty,0) \cup (1,+\infty)$

For 2)

for $x \neq -\frac{3}{2}$

$\dfrac{4}{2x+3} - 1 + 2x \leq 0 \rightarrow$ $\dfrac{4-(2x+3)+2x(2x+3)}{2x+3} \leq 0$

$\dfrac{4-2x-3+4x^2+6x}{2x+3} \leq 0$ $\dfrac{4x^2+4x+1}{2x+3} \leq 0$ $\dfrac{(2x+1)^2}{2x+3} \leq 0$

split points $x=-\frac{1}{2},-\frac{3}{2}$

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

check the split points so $x \in \left(-\infty,-\frac{3}{2}\right) \cup \{-\frac{1}{2}\}.$

For 3)

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

thus the slope of any parallel line is $m=\frac{-1}{2}$;

to find the centre complete the square in $x^2+y^2-8y=0$

$x^2+y^2-2\cdot 4y+(4)^2=16 \rightarrow x^2+(y-4)^2=16$

so the centre is $C(0,4)$ a line passing through C $y=mx+4$

together $y=-\frac{1}{2}x+4$ or $2y+x=8$

For 4) least common denominator,for $x \neq -2,2$:

$\dfrac{x}{x^2-4} - \dfrac{1}{x+2} = \dfrac{x}{(x-2)(x+2)} - \dfrac{1}{x+2} = \dfrac{x-(x-2)}{(x-2)(x+2)} = \dfrac{2}{(x-2)(x+2)}$