The University of Calgary
Department of Mathematics and Statistics
MATH 249-01 Quiz #1R Fall 2010

1. Solve for x:
   $|3x+5| \leq |x-5|$ [3]

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

3. Find the radius of the circle $x^2-2x+y^2+6y=0.$ [2]

4. Simplify $\dfrac{\frac{3x+2}{x}-1}{\frac{x+1}{3}}$ and state fro which x the given expresion is defined. [2]

SOLUTION

For 1)

Since both sides are positive or 0 we can square:

$$(3x+5)^2 \leq (x-5)^2 \rightarrow 9x^2+30x+25 \leq x^2-10x+25$$

$8x^2+40x \leq 0 \rightarrow 8x(x+5) \leq 0$ parabola open up with two roots

$x=0$ and $x=-5$ negative between roots, zero at the roots

OR

split points $x=-5,0$,testing: $--^{pos}---_{-5}---^{neg}---_{0}--^{pos}--$

the solution is $x \in [-5,0]$.

For 2)

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

$\dfrac{x^2+2x+1}{(x+3)} \leq 0$ the polynomial on the top has a double root $\dfrac{(x+1)^2}{(x+3)} \leq 0$

split points $x=-3,-1$

testing $--^{neg}---_{-3}---^{pos}---_{-1}--^{pos}--$

check the split points: $x=-1$ is also a solution $0=0$

so the solution set is $x \in (-\infty,-3) \cup \{-1\}$.

For 3)

complete the squares $x^2-2x+1+y^2+6y+9=0+1+9$

$(x-1)^2+(y+3)^2=10$ so the centre is $C(1,-3)$ and $R=\sqrt{10}$

For 4)

for $x \neq -1,0$ (both) $\quad \dfrac{\frac{3x+2}{x}-1}{\frac{x+1}{3}} = \dfrac{\frac{3x+2-x}{x}}{\frac{x+1}{3}} = \dfrac{2(x+1)}{x} \cdot \dfrac{3}{x+1} = \dfrac{6}{x}$