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

Fall 2008

Name:______________________________**I.D.#:**__________________

1. Solve for x:

   (a) $x + \dfrac{9}{x} > 6$

   (b) $|2x - 1| \leq |x + 1|$. [4]

2. Find the coordinates of the vertex of the parabola $y = 2x^2 - 8x + 1$. [3]

3. Simplify and find all x for which the expressions are defined

$$\frac{1 + \dfrac{2x}{x+1}}{x - \dfrac{3}{x+2}}.$$ [3]

Solution

For 1a)

for $x \neq 0$ $\quad x + \dfrac{9}{x} - 6 > 0 \quad \dfrac{x^2 + 9 - 6x}{x} > 0 \quad \dfrac{x^2 - 6x + 9}{x} > 0$

discriminant of the top is $D = 0$ so double root and the top is always positive or 0

$\dfrac{(x-3)^2}{x} > 0$ split points $x = 0, 3$

testing $\quad {}^{neg}_{x=-1}$——$_0$ $-_{x=0}$ $-^{pos}$ $-_3$ $- -^{pos}_{x=4}$ $-$

check the split points $x = 0, 3$ No, so $x \in (0, 3) \cup (3, +\infty)$.

For 1b)

always $|...| \geq 0$ so both sides positive or 0 we can square

$|2x - 1|^2 \leq |x + 1|^2 \quad 4x^2 - 4x + 1 \leq x^2 + 2x + 1 \quad 3x^2 - 6x \leq 0 \quad 3x(x - 2) \leq 0$

split points $x = 0, 2$

testing $\quad {}^{pos}_{x=-1}$——$_0$ $-_{x=1}$ $-^{neg}$ $-_2$ $- -^{pos}_{x=3}$ $--$

check the split points $x = 0, 2$ OK; so $x \in [0, 2]$.

For 2)

complete the square

$y = 2x^2 - 8x + 1 \to y = 2(x^2 - 4x) + 1 \to y + 8 = 2(x^2 - 4x + 4) + 1 = 2(x-2)^2 + 1$

so $\quad y = 2(x-2)^2 - 7 \quad$ *and* $\quad V(2, -7)$

For 3)

for $x \neq -2, -1$

$$\frac{1 + \dfrac{2x}{x+1}}{x - \dfrac{3}{x+2}} = \frac{\dfrac{x+1+2x}{x+1}}{\dfrac{x^2+2x-3}{x+2}} = \frac{\dfrac{3x+1}{x+1}}{\dfrac{x^2+2x-3}{x+2}} = \frac{(3x+1)(x+2)}{(x^2+2x-3)(x+1)} = \frac{(3x+1)(x+2)}{(x+3)(x-1)(x+1)}$$

for $x \neq -3, -2, -1, 1$.