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

1. Solve for x:
$|x+5| \leq |x-1|$ [2]

2. Solve for x $\frac{3}{x} \leq \frac{2x}{x-2}$. [3]

3. Find an equation of the line perpendicular to the line $2x-5y=1$
and passing through the vertex of the parabola $2x^2+4x-1=y$. [3]

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

SOLUTION

For 1)

Since both sides are positive or 0 we can square:

$(x+5)^2 \leq (x-1)^2 \rightarrow x^2+10x+25 \leq x^2-2x+1$

$12x \leq -24 \rightarrow x \leq -2 \qquad x \in (-\infty, -2]$

For 2)

for $x \neq 0, 2 \qquad \frac{3}{x} - \frac{2x}{x-2} \leq 0 \qquad \rightarrow \frac{3(x-2)-2x^2}{x(x-2)} \leq 0$

$\frac{-2x^2+3x-6}{x(x-2)} \leq 0$ the polynomial on the top has the discriminant

$D = 3^2 - 4(-2)(-6) = 9-48 = -39 < 0$ so no real roots

the top is always negative and only split points are $x = 0, 2$

testing $\quad --^{neg}---_0---^{pos}---_2--^{neg}--$

so the solution set is $\quad x \in (-\infty, 0) \cup (2, +\infty)$.

For 3)

the slope of the given line $2x-5y=1$ is $m = \frac{2}{5}$

so the slope of a perpendicular line is $m_\perp = -\frac{5}{2}$

to find the vertex complete the square $\quad 2x^2+4x-1=y$

$2(x^2+2x) = y+1 \rightarrow 2(x^2+2x+1) = y+1+2$ so

$2(x+1)^2 - 3 = y$ so the vertex is $V(-1,-3)$ and the line is

$y = -\frac{5}{2}(x+1) - 3 \qquad y = -\frac{5}{2}x - \frac{11}{2}$ or $2y+5x = -11$

For 4)

for $x \neq -3 \qquad \frac{x}{2-\frac{1}{x+3}} = \frac{x}{\frac{2(x+3)-1}{x+3}} = x \cdot \frac{x+3}{2x+5} = \frac{x(x+3)}{2x+5}$

for $x \neq -3, -\frac{5}{2}$ (both).