Quiz # 1 **Name:** ______________________________

Math 135: Fall 2019

Instructions:
Please show all your work in order to receive proper credit. You are not allowed to use any calculator, formula sheet, notes or electronic devices. Quiz should be completed in one seating with no breaks. All final answers should be in the simplest form. Box your final answer.

Problem 1. (4 points) Let $f(x) = \dfrac{-2}{x}$. Simplify the difference quotient $\dfrac{f(x+h)-f(x)}{h}$ as much as possible (Assume $h \neq 0$).

Solution: Set up the difference quotient: $f(x) = \dfrac{-2}{x}$, $f(x+h) = \dfrac{-2}{x+h}$ then substitute these in the difference quotient as follows:

$$
\begin{aligned}
\frac{f(x+h)-f(x)}{h} &= \frac{\frac{-2}{x+h} - (\frac{-2}{x})}{h} \\
&= \frac{\frac{-2}{x+h} + \frac{2}{x}}{h} \\
&= \frac{\frac{-2x+2(x+h)}{x(x+h)}}{h} \\
&= \frac{\frac{2h}{x(x+h)}}{h} \\
&= \frac{2}{x(x+h)}
\end{aligned}
$$

Problem 2. (4 points) Solve the inequality and state the domain in interval notation: $x^2 - 2x - 3 > 0$

Solution:
We use the cut-point (or sign chart) method. For our sign chart, the cut points are found by factoring the trinomial and finding the solutions(or cutpoints) by setting it to 0. Therefore, we factor it as $(x-3)(x+1)$ and find the cut points as $x = 3, x = -1$. Now we test the truth of the inequality using a test point from each corresponding sub-interval.

We can pick test points in each sub-interval to test the sign of $f(x)$. Let test points be $x = -2, 0, 4$.

$$f(-2) = 5 > 0$$

$$f(0) = -3 < 0$$

$$f(4) = 5 > 0$$

The sign chart is provided below:

$$f(x) = (x-3)(x+1)$$

$$
\begin{array}{lccccc}
f(x) & +\,+\,+\,+\,+\,+\,+ & 0 & -\,-\,-\,-\,-\,-\,-\,- & 0 & +\,+\,+\,+\,+\,+\,+ \\
 & \text{———————} & | & \text{———————} & | & \text{———————} \\
 & & -1 & & 3 &
\end{array}
$$

Therefore, the domain of $f(x)$ in interval notation is: $(-\infty, -1), (3, +\infty)$.

Problem 3. (2 points) Find the equation of the line passing through the point $(3, -4)$ perpendicular to the line $8x + 6y = 15$.

Solution: When we re-write the equation in slope-intercept form, we obtain $y = -\frac{4x}{3} + \frac{5}{3}$. We see that the slope of the equation is $-\frac{4}{3}$

The slope of the perpendicular line is the negative reciprocal of the slope of this line. Therefore, the slope of the perpendicular line is: $\frac{3}{4}$. The equation of this line in point-slope form is: $y-(-4) = \frac{3}{4}(x-3)$.