EXAM 2 - MATH 102
DATE: Friday, October 13
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 5 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. (a) Consider the relation $R = \{(1,2), (2,3), (3,5), (2,7), (5,9), (3,8)\}$.
   i. Is the relation R a function? Explain. (0.5 points)
   ii. Find the domain $\text{Dom}(R)$. (0.5 points)
   iii. Find the range $\text{Ran}(R)$. (0.5 points)
   iv. Graph R carefully. (0.5 points)

   (b) Consider the functions $f(x) = \frac{1}{(2x-5)(7-9x)}$ and $g(x) = \sqrt{30 - 7x}$.
   i. Find the domain $\text{Dom}(f)$. (1 point)
   ii. Find the domain $\text{Don}(g)$. (1 point)
   iii. Compute the value of $\frac{f(1)+g(2)}{5}$ and simplify. (1 point)

2. Consider the two points $A(-2, 1)$ and $B(3, -8)$.

   (a) Find the slope of the line L_1 that passes through the points A and B. (1 point)

   (b) Find an equation for the line L_1. (1 point)

   (c) Find the slope of the line L_2 that is perpendicular to L_1 and passes through the point $C(2, 1)$. (1 point)

   (d) Find an equation for the line L_2. (1 point)

   (e) A line L_3 passing through the points $D(-3, -1)$ and $E(2, y)$ is parallel to L_1. Find the value of y. (1 point)

3. (a) Consider the linear inequality in two variables $2x - 7y < 14$.
   i. Find the x- and the y-intercepts of the line $2x - 7y = 14$. (1 point)
   ii. Graph the line $2x - 7y = 14$. (1 point)
   iii. In a **different figure**, graph the solution set of the linear inequality $2x - 7y < 14$. (1 point)

   (b) Consider the absolute value inequality in two variables $|x + 1| \geq 2$. Graph the solution set of this inequality. (2 points)

4. How many gallons of a 30% solution must be mixed with 40 gallons of a 12% solution to obtain a 20% solution?

   (a) Set and describe your variables carefully. (1 point)

(b) Write two equations using your variables that mathematically reflect the data in the problem. (2 points)

(c) Solve the system of equations to answer the problem. (2 points)

5. Use the elimination method to solve the following system of 3 equations in 3 variables:

$$\left\{ \begin{array}{rcrcrcr} 2x & - & y & + & z & = & 3 \\ x & + & 4y & - & z & = & 6 \\ 3x & + & 2y & + & 3z & = & 16 \end{array} \right\}$$