Fall 2009 MPC – Set 1, Due by 5pm on Friday, Sep. 18.

Instructions: Welcome to the Fall'09 GSU Mathematics Problem Solving Competition! All GSU Undergrads are eligible. Submit your solutions to the Mathematics office. Please include your name and e-mail address. Have fun! For more information, go to: http://math.georgiasouthern.edu/math/math_competition/math_competition.php

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1. (S. Kersey) Prove that $\frac{|x+y|}{1+|x+y|} \leq \frac{|x|}{1+|x|} + \frac{|y|}{1+|y|}$ for all real numbers x and y. (Hint: you may use the triangle inequality $|x+y| \leq |x| + |y|$).

2. (V. Maymeskul) Two farmers collected x bushels of oranges on their joint farm (equally owned) and sold them for x dollars each. They spent all the money that they gained for buying turkeys, \$10 a head, and one hen. Splitting the purchase, one of them got an extra turkey while the other one took the hen. Since the hen cost less, they used cash to get even. How much cash was paid?

3. (Unknown) Five mathematicians, M_1, M_2, M_3, M_4, M_5, take turns flipping a coin. M_1 flips first, followed by M_2, then M_3, then M_4, then M_5 followed by M_1 again, etc. The game continues until a mathematician has flipped a head, at which time the game is stopped and that mathematician wins the game. Find the probability that some mathematician other than M_1 wins. (Additionally, can you guess what this probability is when the number of mathematicians is infinity?)

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