MATH 210, Discussion 325 Quiz 8 April 14, 2008

Name:

Problem 1 (5 points):
A chalk company (CHALKO) makes fat chalk and skinny chalk. Both models of chalk require shaping and coloring. One box of fat chalk requires 20 hours of shaping and 10 hours of coloring. One box of skinny chalk requires 30 hours of shaping and 10 hours of coloring. The factory has 1200 hours of time to devote to shaping and 500 hours of time to devote to coloring. CHALKO makes a profit of \$20 *for each box of fat chalk and* \$25 *for each box of skinny chalk. CHALKO wants to maximize profit. What equation should it maximize, and what conditions constrain that equation?*

Solution:
Let p be profit, x be the number of boxes of fat chalk, and y be the number of boxes of skinny chalk. Then $p = 20x + 25y$. Moreover, we know that $20x + 30y \leq 1200$ and $10x + 10y \leq 500$ since CHALKO has only 1200 and 500 hours to devote to shaping and coloring, respectively. Finally, we require that $x \geq 0$ and $y \geq 0$ since our factory cannot make a negative number of boxes of chalk.

Problem 2 (10 points):
How many boxes of fat and skinny chalk should CHALKO make to maximize profit? What is the maximum profit?

Solution:
The feasible region is bounded by the equations $x \geq 0$, $y \geq 0$, $y \leq -\frac{2}{3}x + 40$, and $y \leq -x + 50$. Thus, the region is a quadrilateral with corners $(0, 0), (0, 40), (50, 0)$, and $(30, 20)$. The profit associated with each of these points is $\$0, \$1000, \$1000$, and $\$1100$, respectively. Thus, CHALKO should produce 30 boxes of fat chalk and 20 boxes of skinny chalk to make a maximum profit of \$1100.