MTH 152-LINEAR PROGRAMMING (LPG): SAMPLE EXAM

PROBLEM 1. The Penn-Ohio Building Company builds and sells two types of houses: "Cleveland Castles" and "Pittsburgh Palaces". Contracts call for using totals of at least 20,000 feet of framing lumber and 8,000 cubic feet of concrete; and at least $9,000 for promotion and advertising. Each Cleveland Castle requires 4,000 feet of framing lumber, 1,000 cubic feet of concrete and $1,000 promotion and advertising. Each Pittsburgh Palace requires 4,000 feet of framing lumber, 2,000 cubic feet of concrete and $3,000 promotion and advertising. All costs for each Castle come to $4,000 and on each Palace come to $6,000. The minimum total cost achievable (in thousands of dollars) is closest to

A. $40 **B.** $28 **C.** $24 **D.** $26 **E.** $32
F. $38 **G.** $44 **H.** $42 **I.** $34 **J.** $36

PROBLEM 2. The number of Palaces to make for minimal cost is closest to

A. 1.6 **B.** 1.2 **C.** 2.2 **D.** 1.8 **E.** 1.4
F. 2.8 **G.** 2.0 **H.** 3.0 **I.** 1.0 **J.** 2.4

PROBLEM 3. The amount above contract use of promotional money for minimal cost (in thousands) is closest to

A. $2.0 **B.** $2.1 **C.** $1.4 **D.** $2.2 **E.** $1.6
F. $1.3 **G.** $1.2 **H.** $1.5 **I.** $1.9 **J.** $1.8

PROBLEM 4. The Knockdown Furniture Company manufactures stools, chairs, and coffee tables. To manufacture a stool requires two boards, two man- hours of labor and two cans of finish. To manufacture a chair requires two boards, three man-hours of labor and five cans of finish. To manufacture a coffee table requires one board, three man-hours of labor and one can of finish. The company makes a profit of $18 for each stool, $12 for each chair and $12 for each coffee table. Each day, 40 boards, 60 man-hours of labor and 80 cans of finish are available. The maximum daily profit achievable is closest to

A. $360 **B.** $630 **C.** $390 **D.** $570 **E.** $480
F. $660 **G.** $540 **H.** $600 **I.** $450 **J.** $510

PROBLEM 5. The number of stools to be manufactured each day to maximize profit is closest to

A. 22 **B.** 21 **C.** 25 **D.** 18 **E.** 16
F. 15 **G.** 19 **H.** 20 **I.** 23 **J.** 24

PROBLEM 6. The number of cans of finish left over at the optimal point is closest to

A. 39 **B.** 31 **C.** 37 **D.** 34 **E.** 38
F. 36 **G.** 35 **H.** 33 **I.** 32 **J.** 40

EXAM CONTINUES ON BACK OF SHEET

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PROBLEM 7. Maximize $z = 8y - x$ subject to constraint 1: $x + y \leq 8$, constraint 2: $2x - 3y \geq 1$, and constraint 3: $x \leq 6$, with $x \geq 0$, $y \geq 0$. The maximum value of z is closest to:

A. 26 **B.** 17 **C.** 8 **D.** 2 **E.** 20
F. 23 **G.** 32 **H.** 29 **I.** 11 **J.** 5

PROBLEM 8. When z is maximum, the surplus in constraint 2 is closest to:

A. 1 **B.** 3 **C.** 2 **D.** 5 **E.** 8
F. 6 **G.** 7 **H.** 0 **I.** 4 **J.** 9

PROBLEM 9. The simplex method is being used to maximize $F = 4x + y + 3z$, subject to $x + y + 3z \leq 5$, $4x + 3y + 2z \leq 7$, $2x + 3z \leq 4$, $x \geq 0$, $y \geq 0$, $z \geq 0$. Find a suitable initial matrix. Then there is a row whose entries add to exactly

A. 20 **B.** 4 **C.** 18 **D.** 10 **E.** 12
F. 8 **G.** 6 **H.** 22 **I.** 2 **J.** 16

PROBLEM 10. A linear programming problem with three variables for minimizing by dualizing has gotten to the stage shown below. Then the value of the third variable is closest to

$$\begin{bmatrix} 1 & -1 & 0 & 0 & 4 & -2 & 3 \\ 0 & 0 & 1 & 0 & 1 & 14 & 5 \\ 0 & 7 & 0 & 1 & 5 & 5 & 11 \\ 0 & 3 & 0 & 0 & 8 & 19 & 3 \end{bmatrix}$$

A. 13 **B.** 11 **C.** 14 **D.** 19 **E.** 17
F. 16 **G.** 15 **H.** 10 **I.** 12 **J.** 20

PROBLEM 11. Expand $5x - 2[x - (-3 + 4x)]$ to remove the parentheses. The resulting polynomial equals:

A. $-5x - 6$ **B.** $15x - 6$ **C.** $5x - 6$ **D.** $-11x + 6$ **E.** $-5x + 6$
F. $x - 6$ **G.** $11x + 6$ **H.** $-x + 6$ **I.** $x + 6$ **J.** Not listed here.

PROBLEM 12. Simplify $\frac{f(x+h)-f(x)}{h}$ given $f(x) = x^2 - 5x - 4$

A. $-2x + h - 5$ **B.** $2x + h$ **C.** $-2x + h$ **D.** $-2x - h + 5$ **E.** $-2x - h - 5$
F. $2x + h + 5$ **G.** $2x - h - 5$ **H.** $2x - h$ **I.** $2x + h - 5$ **J.** Not listed here.

The correct answers are: 1-D, 2-H, 3-A, 4-C, 5-F, 6-J, 7-E, 8-H, 9-D, 10-D, 11-J, 12-I