DEPARTMENT OF MATHEMATICS

Ma 162 First Exam February 4, 2008

DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO.

Instructions: Be sure your name, section number, and student ID are filled in below.
Cell phones must be OFF and put away before you open this exam. You may use calculators (including graphing calculators, but no laptops or cellphone cacluators) for checking numerical calculations, but you must show your work to receive credit.
Put your answers in the answer boxes provided, and show your work.
If your answer is not in the box or if you have no work to support your answer, you will receive no credit.
The test has been carefully checked and its notation is consistent with the homework problems. No additional details will be provided during the exam.

Problem	Maximum Score	Actual Score
1	12	
2	12	
3	15	
4	15	
5	12	
6	6	
7	16	
8	12	
Total	100	

Please fill in the information below.

NAME: _____ **Section:** _____
Last four digits of Student ID: _____

1. The equation for Fahrenheit temperature in terms of Centigrade temperature is $F = \frac{9}{5}C + 32$.

   a) When is the Fahrenheit temperature equal to 4 times the Centigrade temperature?

   Answer: When $F =$ [ ]

   b) Can 5 times the Fahrenheit temperature ever be 8 more than 9 times the Centigrade temperature? ($5\,F = 9\,C + 8$) Why or why not?

   Answer: [ ]

2. A tourist travels from city A with coordinates $(0, 0)$ to city C with coordinates (12,10). He must pass through **exactly one of the cities** $B(7, 5)$ or $D(5, 7)$ along the way. Assume he travels the straight line between cities.

   a) Which city should he pass through (B or D) in order to minimize his trip distance from A to C?

   He should pass through city [ ] on his way to C.

   b) What is the total minimum length of his trip from A to C?

   Minimum trip length is: [ ]

3. Point A has coordinates $(6, 1)$,and point B has coordinates $(0, 8)$.

   a) What is the distance from A to B and what is the slope of the line through A and B?

   distance: [ ], slope: [ ]

   b) Find the number y so that the point C with coordinates $(9, y)$ lies in the first quadrant and triangle ABC is a right triangle with right angle at A. (Note: The coordinates of A and B were given at the top of the problem.)

   $y =$ [ ]

4. The cost function for a manufacturer is $C = 4\,x + 6600$, where x is the number of units produced per month and C is measured in dollars. His revenue is \$11 per unit.

   a) Determine the manufacturer's profit $P = m\,x + b$, assuming he can sell all the units he manufactures.

   $P =$ [ ] $x+$ [ ]

   b) Determine the breakeven value for x and the breakeven cost C at that value for x.

   $x =$ [ ] $C =$ [ ]

5. In a free market, the supply equation for a supplier of wheat is $x = 40\,p + 100$ where p is in dollars and x is in bushels. When the price is \$1 per bushel the demand is 540 bushels. When the price goes up to \$10 per bushel the demand is 0 bushels. Find the equilibrium price and the number of bushels supplied at the equilibrium price.

$p =$ $\qquad$ $x =$ $\qquad$

6. For what value of k is the system $\begin{cases} x - 2\,y + z = 1 \\ 2\,x + y + 3\,z = 0 \\ y + kz = 0 \end{cases}$

inconsistent (i.e. has no solution)?

Answer: $k =$ $\qquad$

7. Given the system of equations $\begin{cases} -x + y + 3\,z = 0 \\ 2\,x - y - 4\,z = -1 \\ 2\,x - 2\,y - 5\,z = 2 \end{cases}$

a) Write the augmented matrix for the system.

b) Carry out standard row reductions to convert the augmented matrix to REF(row echelon form). Be sure to describe your reductions in standard notation. Just giving the final form will receive no credit.

8. You are given the system of equations $\begin{cases} -x + y - 3\,z = -3 \\ 2\,x - y + 5\,z = 5 \\ 2\,x - 2\,y + 7\,z = 8 \end{cases}$

   Here is the augmented matrix of the system reduced to a row echelon form.

   $$\begin{pmatrix} 1 & 0 & 2 & 2 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & 1 & 2 \end{pmatrix}$$

   Use it to decide if the system has **no solutions, 1 solution, or more than 1 solution**. Give your reason and describe the solution completely.

1 Answer Key for exam1_v1

1.
   - ◇ $F = \frac{640}{11}$ or $F = 58.18181818$
   - ◇ No, because 'the system is inconsistent' or 'the graphs do not cross'

2. ◇ B
   - ◇ $\sqrt{74} + 5\sqrt{2} = 15.67$

3.
   - ◇ $AB = 9.219544457$
   - ◇ $m = -1.166666667$
   - ◇ $y = 3.571428571$

4.
   - ◇ $P = 7x - 6600$
   - ◇ $x = \frac{6600}{7}$ and $C = \frac{72600}{7}$

5. ◇ $p = 5$
   - ◇ 300

6. ◇ $k = 1/5$

7.
   - ◇ $\begin{pmatrix} -1 & 1 & 3 & 0 \\ 2 & -1 & -4 & -1 \\ 2 & -2 & -5 & 2 \end{pmatrix}$
   - ◇ $\begin{pmatrix} -1 & 1 & 3 & 0 \\ 0 & 1 & 2 & -1 \\ 0 & 0 & 1 & 2 \end{pmatrix}$

8.
   - ◇ unique solution: 3 pivots, none in last column or equivalent