MATH 1070 Final – Spring 2005 Name ____

Part 1 Fill in the Blank Questions. Each question is worth 2 points with a maximum of 50 points possible (50 points if 25, 26 or 27 answers are correct.) No partial credit is given. All answers are to be exact unless the problem states the number of decimal places.

1. The slope of the line through the points (3,1) and (-2,6) is ________

2. The asymptotes, written as equations, of the graph of $g(x) = \dfrac{x-3}{x+4}$ are

horizontal asymptote: ___________ and vertical asymptote: __________

3. The domain of $f(x) = \dfrac{x}{x^2-1}$ is ___________________________

4. Solve for n in terms of the other variables if $A = P(1+i)^n$:

$n =$ ______________________

5. $3\ln(x+2) - 2\ln(x+1) = \ln($ ___________________ $)$

6. $\dfrac{a^{x+4}}{a^{3-2x}} = a^?$ where ? = ________________

7. $e^{2t}e^{5-3t} = e^?$ where ? = ________________

8. How many years would it take \$100 to grow to \$200 in an account earning 4%

continuous interest ? _____________________ (round to one decimal place)

9. If you need \$5000 in two years and can deposit \$4500 into an account earning interest compounded monthly, what yearly interest rate must the account have?

________________________ (round to two decimal places)

10. If \$50 every 6 months is deposited into an account earning 6% compounded twice a year, how much will be in the account at the end of 20 years?

__________________ (round to 2 decimal places)

11. How much will you receive from a retirement fund each month for 20 years if the account has \$500,000 with 4.8% interest compounded monthly?

__________________ (round to 2 decimal places)

12. The matrix $\begin{bmatrix} 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ is in reduced echelon form: Yes   No   (Circle one)

13. Let $A = \begin{bmatrix} 1 & 3 & -1 \\ 2 & 3 & 2 \\ 5 & -2 & 4 \end{bmatrix}$. Use one row operation to get a 0 in the second row and first colume of A: $A \sim \begin{bmatrix} 1 & 3 & -1 \\ \square & \square & \square \\ 5 & -2 & 4 \end{bmatrix}$

14. Let $A = \begin{bmatrix} 2 & -2 \\ 1 & 0 \\ 3 & 2 \end{bmatrix}$, $D = \begin{bmatrix} 3 & -2 & 1 \\ -1 & 1 & 2 \end{bmatrix}$, and $E = \begin{bmatrix} 3 & -4 \\ -1 & 0 \end{bmatrix}$, then $DA - 3E =$

____

15. If $\begin{bmatrix} 2 & 1 & -4 \\ 1 & -2 & 3 \\ 2 & -1 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 3 \\ 2 \end{bmatrix}$, then $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \square \\ \square \\ \square \end{bmatrix}$

16. The augmented matrix of a system with variables x, y and z row-reduces to $\begin{bmatrix} 1 & 0 & 4 & 3 \\ 0 & 1 & -1 & 2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$. Find the solution in terms of the parameter t:

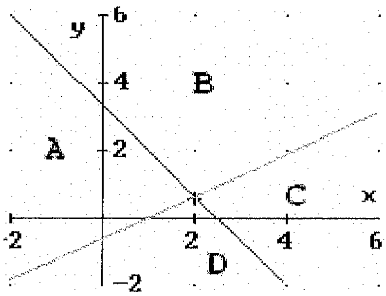
(x,y,z) = (__________ , ________ , ________)

17. If $\begin{bmatrix} x & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 4 & 1 \end{bmatrix} = \begin{bmatrix} y & y \\ 2 & 1 \end{bmatrix}$ then $x =$ __________ and $y =$ __________

18. The solution to a linear system of inequalities is a bounded region with corners (x,y) = (0,0), (0,10), (5,6) and (8,0). If the objective function is P = 5x + 2y, then

max P = ____________

19.



On the left is a graph of the system

$$\begin{array}{rcrcl} 5x & - & 8y & \le & 5 \\ 4x & + & 3y & \ge & 10 \end{array}$$

Which region corresponds to the solution?

A or B or C or D (Circle one)

20. If x is the number of red roses and y is the number of white roses, then translate the following statement into a mathematical statement: "There are twice as many red roses and white roses."

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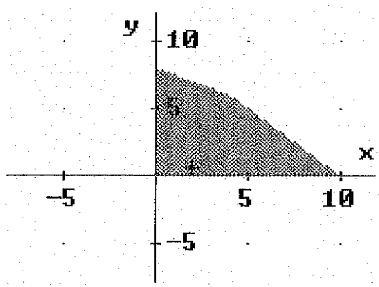
21. Solve for y if $6x-5y \le 13$: y __________________________

22.



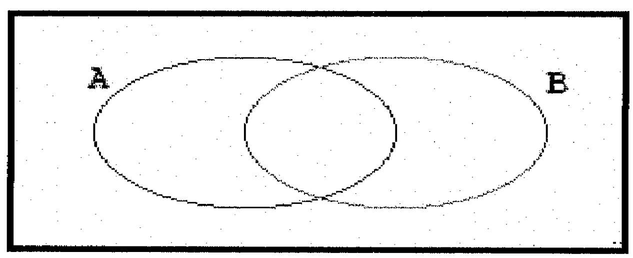
On the left is a graph of the system

$$\begin{array}{rcrcl} x & + & y & \le & 10 \\ 2x & + & 4y & \le & 32 \\ & & x, y & \ge & 0 \end{array}$$

List the corners of the region:

____

23. A sample space has 10,000 equally likely events. A has 6800 events, B has 5200 events, and there are 3536 events in common with A and B. Fill in the numbers in the Venn Diagram.



24. For the sample space above, P(A or B) = ________________

25. For the sample space above, P(A|B) = __________________________

26. For the sample space above, A and B are dependent or independent (circle one)

27. For the sample space above, P(not A) = ___________

Part 2: Each problem is worth 10 points. Show all your work. Partial credit will be given.

1. A company manufacturing charcoal grills has fixed costs of \$300 per day and total costs of \$780 per day at a daily output of 20 grills. Following market research, a price-demand function, $p(x) = 180 - 3x$, was found for the grills where x is the number of grills sold per day.

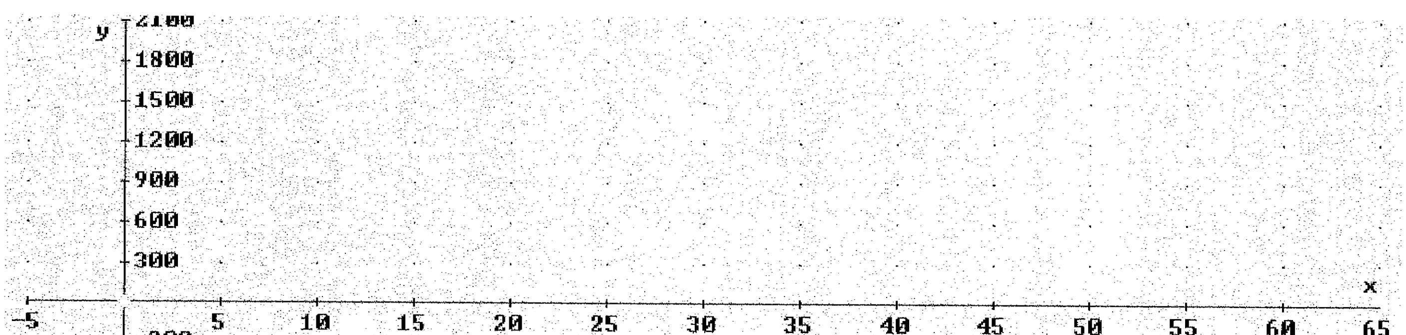
a) Assuming the cost function, $C(x)$, is linear, find $C(x)$.

b) Find the revenue function $R(x)$.

c) Find the break-even points where $R(x) = C(x)$

d) Find the value of x that maximizes the profit and find the maximum profit

e) Graph $R(x)$ and $C(x)$, label two points on the graph and label where $R(x) < C(x)$ and $R(x) > C(x)$



2. Anna deposits \$100 a month into an account with an annual interest rate of 8% compounded monthly.

a) After 10 years, how much is in the account?

b) How much interest has the account earned?

c) After the first 10 years, Anna stops making payments but leaves the money in the account earning interest. How much is in the account 20 years after she stops making payments?

d) How much total interest has the account earned over the entire 30 years?

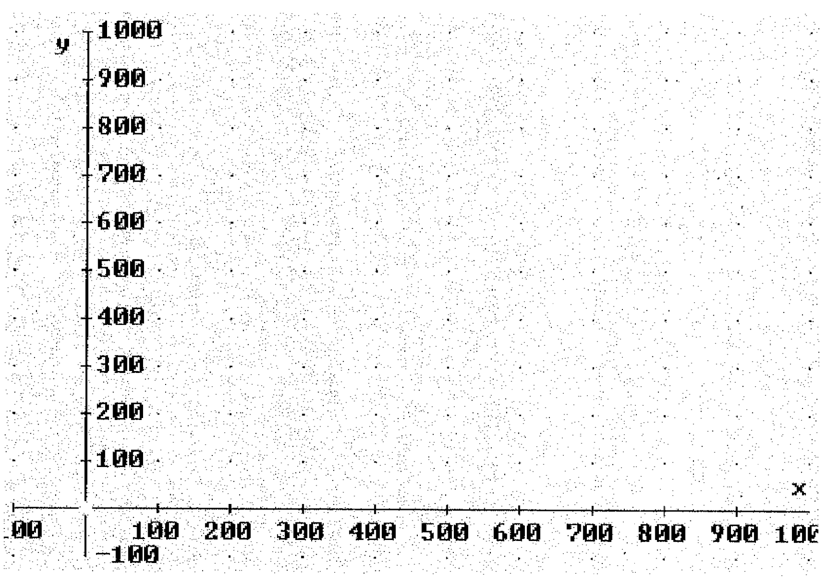
3. A manufacturer produces two models of tents, Model A and model B. Model A requires 1 hour of cutting and 0.8 hours of assembly. Model B requires 1.6 hours of cutting and 1 hour of assembly. On a weekly basis, the factory has exactly 992 hours of labor available in cutting and exactly 704 hours in assembly. How many of each model can the factory produce each week if all the labor hours are used?

a) Define you variables:

b) Set up the system of equations:

c) Solve the system by any method:

d) Graph the system of equations and label your solution



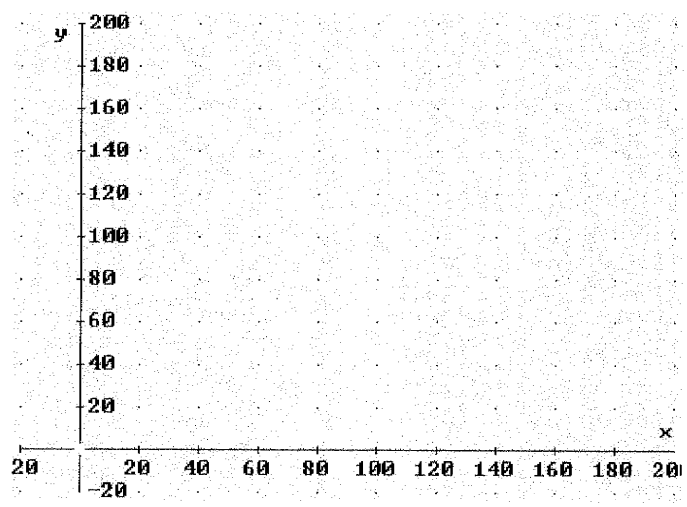
4. A laboratory technician in a medical research center is asked to formulate a diet from two commercially packaged foods, food A and food B, for a group of animals. Each ounce of food A contains 8 units of fat, 16 units of carbohydrate, and 2 units of protein. Each ounce of food B contains 4 units of fat, 32 units of carbohydrate, and 8 units of protein. The minimum daily requirements are 176 units of fat, 1,224 units of carbohydrate, and 384 units of protein.

a) Define your variables:

b) Set up the system of inequalities to meet the minimum daily requirements:

c) List the corner points:

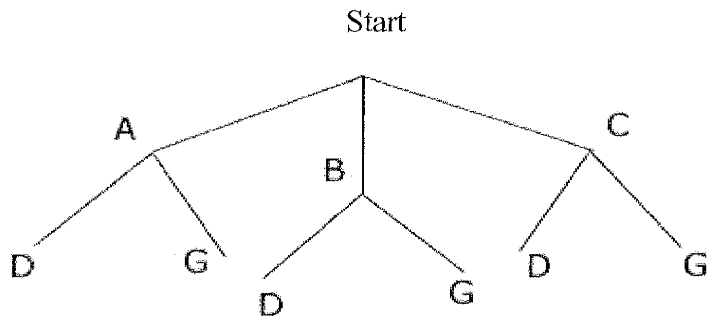
d) Graph the system and label the corners.



e) If food A costs 5 cents per ounce and food B costs 5 cents per ounce, how many ounces of each food should be used to meet the minimum daily requirement at the least cost?

5. A computer manufacturer obtains hard-drives from three different suppliers: 50% from A, 20% from B, 30% from C. It has been found that 4% of the drives from A, 2.5% of the drives from B, and 5% of the drives from C are defective.

a) Fill in the following tree diagram (D = defective and G = good)



b) List all the probability for the sample space:

X =	AD	AG	BD	BG	CD	CG
P(X) =						

c) What is the probability that a board chosen at random will be defective?

d) Given a board chosen at random is defective, what is the probability that it came from supplier B?

MATH 1070

Facts and Formulas

Algebra

$$a^x \cdot a^y = a^{x+y} \quad \frac{a^x}{a^y} = a^{x-y} \quad (a^x)^y = a^{xy} \quad (\frac{a}{b})^x = \frac{a^x}{b^x} \quad (ab)^x = a^x b^x$$

$$a^x = a^y \text{ iff } x = y \quad a^x = b^x \text{ iff } a = b, x \neq 0$$

$$\log_b 1 = 0 \quad \log_b b = 1 \quad \log_b b^x = x \quad b^{\log_b x} = x \ \ (x > 0)$$

$$\log_b(xy) = \log_b x + \log_b y \quad \log_b(x^n) = n \log_b x \quad \log_b(\frac{x}{y}) = \log_b x - \log_b y \quad \log_b x = \log_b y \text{ iff } x = y$$

Cost function: $C = \text{(fixed costs)} + \text{(variable costs)} = a + bx$

Price-demand: $p = m - nx$

Revenue function: $R = xp = x(m - nx)$

Profit function: $P = R - C = x(m - nx) - (a + bx)$

Finance

Simple interest: $I = Prt$

Simple interest: $A = P(1 + rt)$

Compound interest: $A = P\,(1 + i)^n$ or $A = P\left(1 + \frac{r}{m}\right)^{mt}$

Continuous interest: $A = Pe^{rt}$

Annual percentage yield: $APY = \left(1 + \frac{r}{m}\right)^m - 1$

Future value ordinary annuity: $FV = PMT\frac{(1+i)^n - 1}{i}$

Present value ordinary annuity: $PV = PMT\frac{1-(1+i)^{-n}}{i}$

Counting and Probability

$$\text{Permutations: } {}_nP_k = \frac{n!}{(n-k)!} \qquad \text{Combinations: } {}_nC_k = \frac{n!}{(n-k)!\ k!}$$

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$