** You may use one side of a piece of paper (8.5" X 11") with handwritten notes during the exam. **

Due Exam Day (_____)   _____

<u>Variation</u>   Name

1. Write an equation for
   a) x varies directly as the square of q
   b) p varies inversely as z
   c) y varies jointly as a and b
   d) y varies directly as c and inversely as d

2. In part b, if p=8 when $z = 2$, find p if $z = 3$.

<u>Properties</u>

3. Name the property illustrated by: (see page S1 – back of book)

   a) if $a = c$, then   b) $a(b+c) = ab + ac$ c) $1 * a = a * 1 = a$
      $a * b = c * b$

   d) $2 * 3 = 3 * 2$ e) $a + 0 = 0 + a$

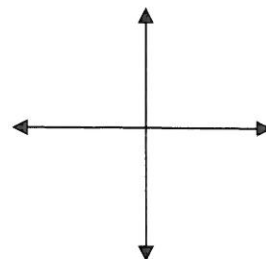   f) $2 * 1/2 = 1/2 * 2$ g) $a + (- a) = - a + a = 0$

<u>Equations of line; inequalities; slopes</u>
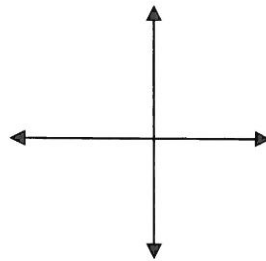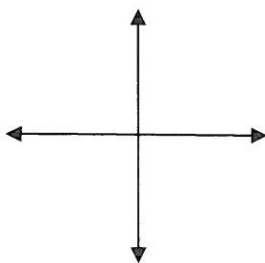
4. Graph

   a) $\begin{cases} x \geq 3 \\ y < 2 \end{cases}$ b) $2x + 3y = 6$ c) $5x - 2y = 20$ (__ , 0)
                                   (use slope-intercept form)   (0 , __)

   d) Write an equation for the   e) What is the equation of a line
      line through (2, - 5) and (-3, 1).   perpendicular to # d, use $y-y_1 = m(x-x_1)$

f) graph $\begin{cases} y < x + 4 \\ y \geq x - 2 \end{cases}$

g) It cost $250 to make 100 baskets & $500 to make 300 baskets. Assuming a linear relationship, how much would it cost to make 1000 baskets?
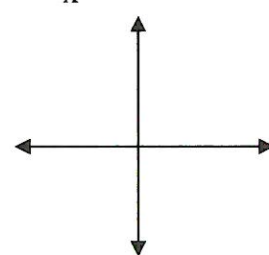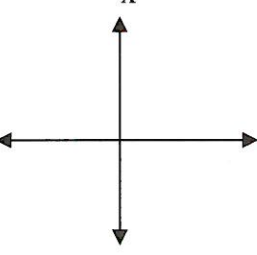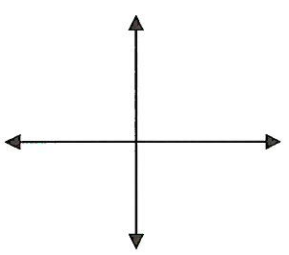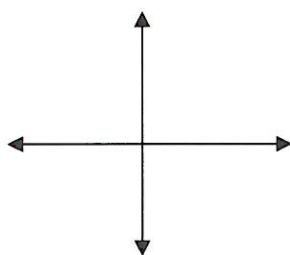
Graphs

5. Draw a <u>rough</u> sketch of each (Ch. 2 <u>Note</u>: see pg 139 for help / domain, range, asymptotes)

a) $y = 2x^2$

b) $y = -2x^2$

c) $y = \dfrac{2}{x^2}$
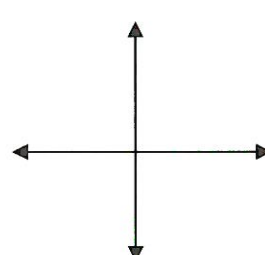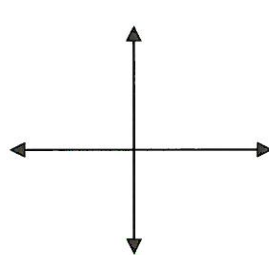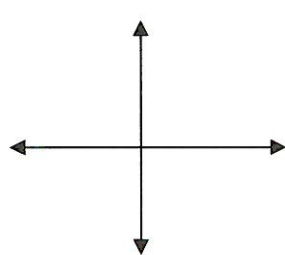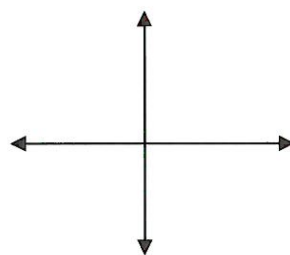
d) $y = \dfrac{-2}{x^2}$
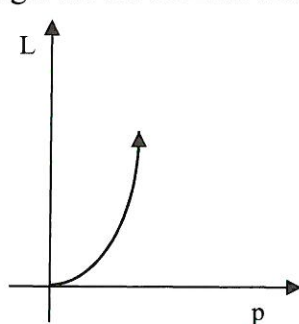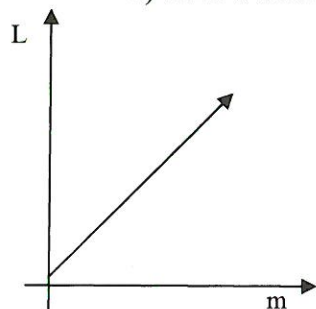
e) $y = \dfrac{2}{x}$

f) $y = \dfrac{-2}{x}$

g) $y = 2x$

h) $y = -2x$

6) Give a formula which might model the following

a) $L = km^2p^2$
b) $L = kmp^2$
c) $L = \dfrac{km}{p^2}$
d) $L = \dfrac{km^2}{p^2}$

Transformations and Matrices

7) Tell what each of these transformations does.   (Ch. 4) <u>Note</u>: see pg 289-290 for transformation matrices

a) S_2

b) $S_{2,3}$

c) r_x

d) r_y

e) $r_{y=x}$

f) R_{90}

g) R_{180}

h) R_{270}

i) $T_{2,3}$

8. Give the matrices for each of the above transformation.

a)   d)   g)

b)   e)   h)

c)   f)   i)

9. Find the inverse of $\begin{bmatrix} 2 & 3 \\ -5 & 9 \end{bmatrix}$

10. Multiply:

$\begin{bmatrix} 2 & 3 & 1 \\ 4 & 6 & -1 \end{bmatrix} \begin{bmatrix} 1 & 5 \\ -2 & 0 \\ 1 & 8 \end{bmatrix} = \begin{bmatrix} & \\ & \end{bmatrix}$

2 X 3   3 X 2   2 X 2

11. Solve the following systems:

a)
$$\begin{cases} a = 4b \\ c = b + 11 \\ 3c - 8a = 4 \end{cases}$$

b)
$$\begin{cases} -3x + 3y = 2 \\ -4x - 2y = 3 \end{cases}$$

c) Solve using matrices
$$\begin{cases} 2x - 9y = 14 \\ 6x - y = 42 \end{cases}$$

Arithmetic Sequences   (Recursive and Explicit)

12. Give the sequence:
(first four terms)
$$\begin{cases} a_1 = 4 \\ a_n = 5 * a_{n-1} + 1, \, n>1 \end{cases}$$

13) Give the sequence: (first four terms)

$a_n = 340 + (n-1)2$

14. Is the following sequence arithmetic? Why or Why not? 10, 15, 20, 24, 29, ...

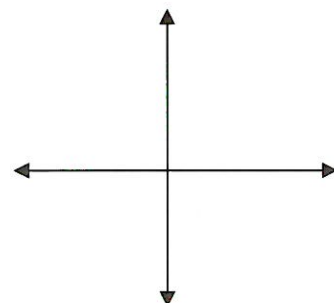## Quadratic Functions

15. Suppose a rectangular swimming pool with dimensions 100 feet by 12 feet is surrounded by a walkway of width w.

a) Write a quadratic expression in standard form that gives the area of the pool and walkway together.

b) Write an expression that gives the area of the walkway only.

16. Sketch $y+2 = -2(x-1)^2$

Where is the vertex? _____
Write the equation in standard form.

17. Write the equation for the height of a projectile launched at 60 ft/sec from a 5 ft high launch pad. How high is the projectile at 3 seconds? What is the maximum height? When does it reach its maximum height? Approximately when does it hit the ground?

18. Solve:

a) $(x-5)^2 = 16$

b) $x(x + 1) = 1$

c) $x^2 + 25 = 0$

d) $10x^2 - 7x = 6$

19. Which of the following are: $-\frac{2}{3}$, i, 17, π, $\sqrt{-1}$, $\sqrt{45}$, $3 + i$, $\sqrt{36}$ (see notes 6-7, 6-8, and page 430)

   a) real? _____

   b) rational? _____

   c) irrational? _____

   d) imaginary? _____

20. Give the <u>number</u> of real solutions to the following (Hint: find the discriminant!)

a) $4x^2-12x + 9 = 0$ b) $2x^2 + 3x + 4 = 0$ c) $x^2 - 9x + 8 = 0$

21. Use quadratic regression (or use Substitution and Elimination) to find an equation for the parabola that contains the given points

   a) $(4, -6), (-2, 30), (0, 10)$

   b) $(-1, -3), (5, 81), (2, 12)$

22. Give the equation for the line through (6,7) and parallel to $y = \frac{2}{3}x + 8$.

23. Find the equation for the line through (8, -9) and perpendicular to $y = \frac{4}{7}x + 3$.

24. Is the following a function? (Lesson 1-2)

a)
X	0	1	5	1	2
Y	3	7	-8	10	4

b)
X	0	1	5	1	2
Y	3	7	-8	7	7

25. a) Simplify $(3 + 5i) - (1 + 2i)$

b) Simplify $(7 - 8i) + (6 - i)$

26. a) Simplify $(4i - 2)(7i + 5)$

b) Simplify $(7i)(5i)$

27. a) The cost of your gas varies _____ as the cost per gallon.

b) You have $25 to buy gas. The number of gallons of gas you can buy varies

_____ as the cost per gallon.

28. For each of the following identify the slope.

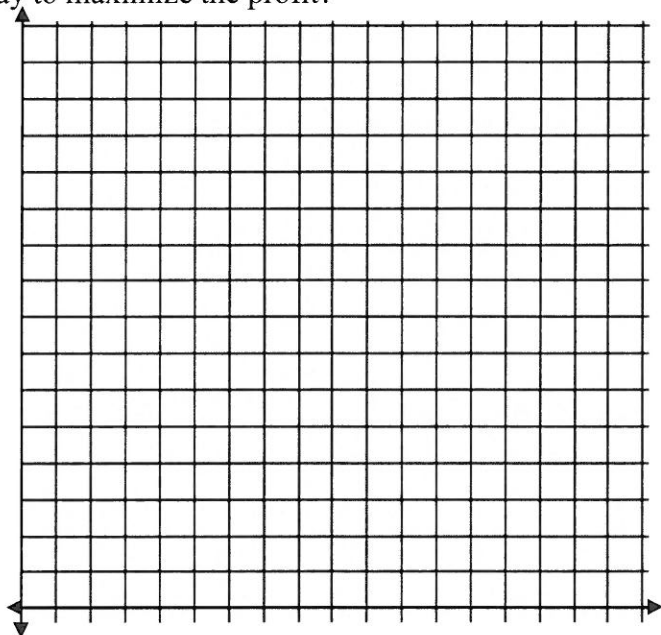a) $y = \frac{4}{7}(x - 2)$

b) $x = 3$

c) $y = -7$

29) A furniture manufacturer makes sofas and chairs. On an average day it takes carpenters 7 hrs to build a chair and 4 hrs for a sofa. There are enough carpenters for no more than 133 worker hours per day. Upholsterers average 2 hrs per chair and 6 hrs per sofa. There are enough upholsterers for no more than 72 worker-hours per day. The profit per chair is $80 and the profit per sofa is $70. How many sofas and chairs should be made per day to maximize the profit?
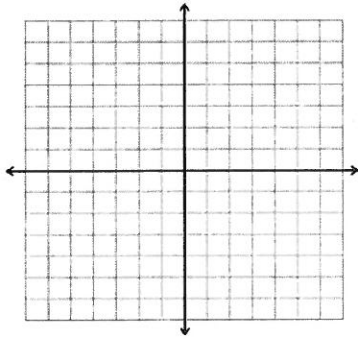
a)   The equations are:

b)   Graph the system and find the vertices.

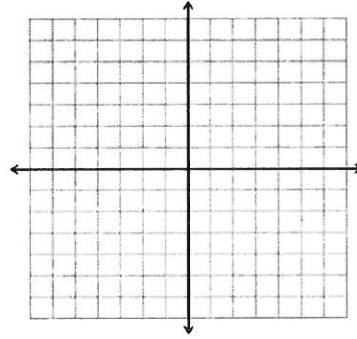c)   Apply the Linear-Programming Theorem and interpret the results.

30) Write the equation in vertex form. $y = x^2 + 10x - 6$ (complete the square)

31) Graph $y = \dfrac{1}{X}$

32) Graph $y = \dfrac{2}{X^2}$

33a) Solve: $\dfrac{3}{2}x = 9$

b) $\dfrac{6}{x} = 8$

c) $8 - (x + 7) \leq 1$

34) Solve for n: $t_n = 4 - 5n$

35a) Solve: $| 3.4 - x | = 6.5$

b) $| 96 - n | = -3$

37) Write the recursive formula
     given $a_n = 2n - 11$

38) T/F The line with equation $y-5 = 3(x-2)$
    goes through the point (5, 2)

39) Solve the system $\begin{cases} y = 4x \\ xy = 36 \end{cases}$

40) If x > y, solve the system for x and y.
    $\begin{cases} xy = 27 \\ x + y = 12 \end{cases}$