Math 1324 – Finite
Professor: Fred Khoury

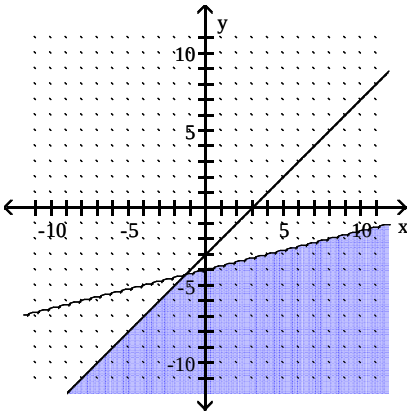
Practice Exam 1

1) Graph the feasible region for the system of inequalities. 1) _____

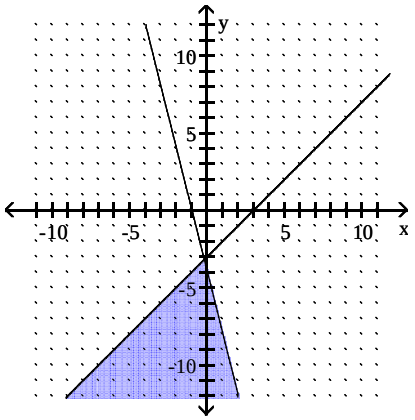
$4x + y \le -4$

$x - y \ge 3$

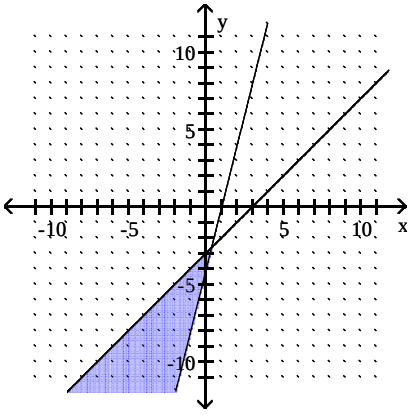
A)



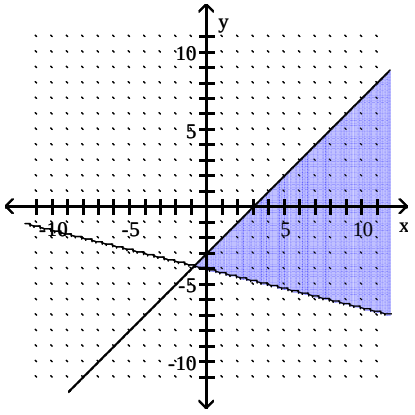
B)



C)



D)



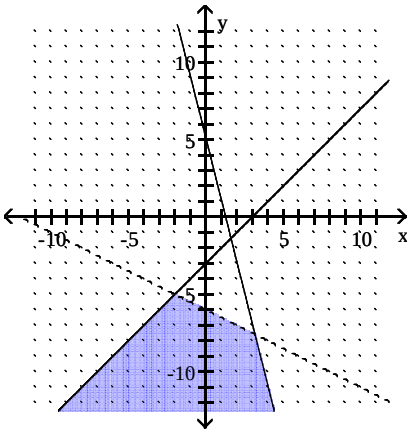
2) Graph the feasible region for the system of inequalities. 2) _____

$4x + y \leq 5$

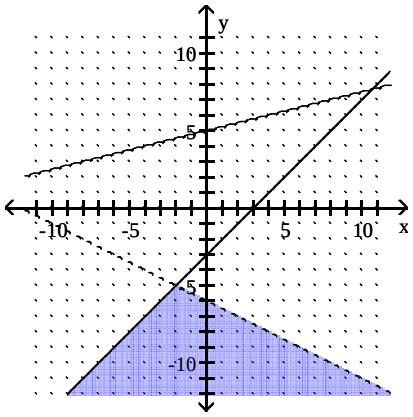
$x - y \geq 3$

$x + 2y < -12$

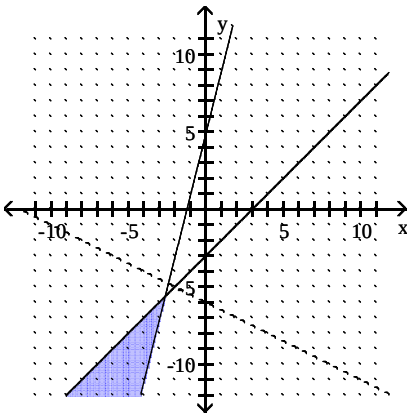
A)



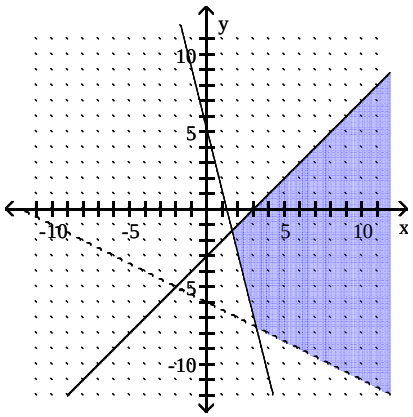
B)



C)



D)



3) The Pen–Ink Company manufactures two ballpoint pens: silver and gold. The silver requires 5 minutes in a grinder and 6 minutes in a bonder. The gold requires 5 minutes in a grinder and 14 minutes in a bonder. The grinder can be run no more than 420 minutes per day and the bonder no more than 290 minutes per day. Let x represent the number of silver pens, and let y represent the number of gold pens. Find the system of inequalities that represents this company's daily production of silver and gold pens. 3) _____

A) $x + y \le 420$
$x + y \le 290$
$x + y \le 710$
$x \ge 0, y \ge 0$

B) $0 \le 11x + 19y \le 710$
$x \ge 0, y \ge 0$

C) $5x + 5y \le 420$
$6x + 14y \le 290$
$x \ge 0, y \ge 0$

D) $5x + 6y \le 420$
$5x + 14y \le 290$
$x \ge 0, y \ge 0$

4) A manufacturer of wooden chairs and tables must decide in advance how many of each item will be made in a given week. Use the table to find the system of inequalities that describes the manufacturer's weekly production. Use x for the number of chairs and y for the number of tables made per week. The number of work–hours available for construction and finishing is fixed. 4) _____

	Hours per chair	Hours per table	Total hours available
Construction	2	3	36
Finishing	2	2	28

Write the system of inequalities that describes the possible solutions to the problem.

A) $2x + 3y \le 36$
$2x + 2y \le 28$
$x \ge 0$
$y \ge 0$

B) $2x + 3y \le 28$
$2x + 2y \le 36$
$x \ge 0$
$y \ge 0$

C) $2x + 3y \ge 28$
$2x + 2y \ge 36$
$x \ge 0$
$y \ge 0$

D) $2x + 3y \ge 36$
$2x + 2y \ge 28$
$x \ge 0$
$y \ge 0$

5) An airline with two types of airplanes, P_1 and P_2, has contracted with a tour group to provide transportation for a minimum of 400 first class, 750 tourist class, and 1500 economy class passengers. Airplane P_1 can accommodate 20 first class, 50 tourist class, and 110 economy class passengers. Airplane P_2 can accommodate 18 first class, 30 tourist class, and 44 economy class passengers. Let x represent the number of planes of type P_1 and y represent the number of planes of type P_2. 5) _____

A) $20x + 50y + 110z \geq 400$
$18x + 30y + 44z \geq 750$
$x \geq 0, y \geq 0$

B) $20x + 18y \leq 400$
$50x + 30y \leq 750$
$110x + 44y \leq 1500$
$x \geq 0, y \geq 0$

C) $20x + 18y \geq 400$
$50x + 30y \geq 750$
$110x + 44y \geq 1500$
$x \geq 0, y \geq 0$

D) $20x + 18y \geq 400$
$50x + 44y \geq 750$
$110x + 30y \geq 1500$
$x \geq 0, y \geq 0$

6) Use graphical methods to solve the linear programming problem. 6) _____

Maximize $z = 6x + 7y$
subject to: $2x + 3y \leq 12$
$2x + y \leq 8$
$x \geq 0$
$y \geq 0$

A) Maximum of 32 when $x = 3$ and $y = 2$
B) Maximum of 52 when $x = 4$ and $y = 4$
C) Maximum of 24 when $x = 4$ and $y = 0$
D) Maximum of 32 when $x = 2$ and $y = 3$

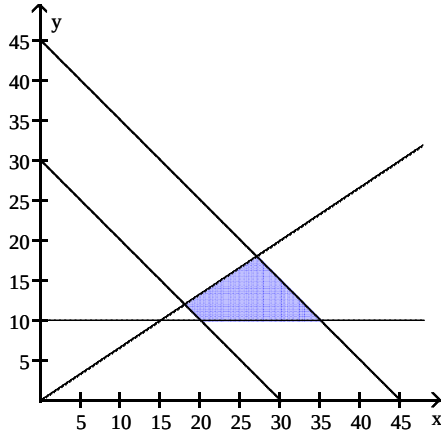
7) Use the simplex method to solve the linear programming problem. 7) _____

Maximize $z = 5x_1 + 3x_2$
subject to: $2x_1 + 4x_2 \leq 13$
$x_1 + 2x_2 \leq 6$
with $x_1 \geq 0, x_2 \geq 0$

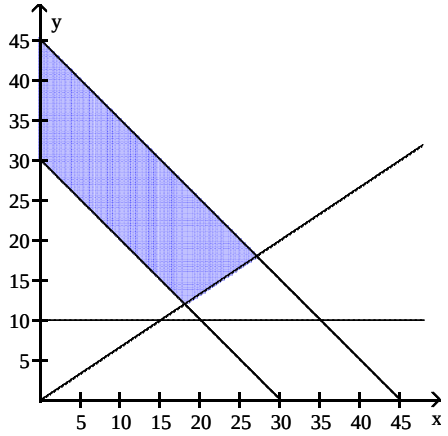
A) Maximum is 30 when $x_1 = 6, x_2 = 0$
B) Maximum is 9 when $x_1 = 0, x_2 = 3$
C) Maximum is 32.5 when $x_1 = 6.5, x_2 = 0$
D) Maximum is 18 when $x_1 = 0, x_2 = 6$

8) A summer camp wants to hire counselors and aides to fill its staffing needs at minimum cost. The camp can accommodate up to 45 staff members and needs at least 30 to run properly. They must have at least 10 aides, and may have up to 3 aides for every 2 counselors. Let x represent the number of counselors and y the number of aides. ***Graph the feasible region of the system.*** 8) _____

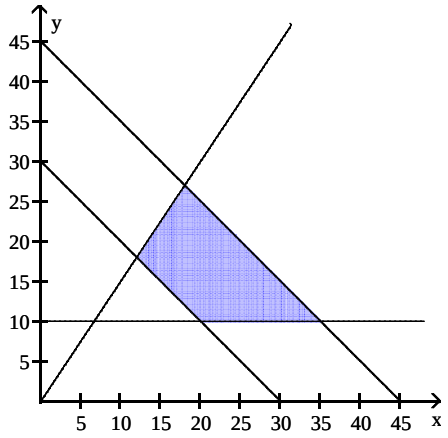
A) $x + y \le 45$, $y \ge 10$, $y \le \frac{2}{3}x$, $x \ge 0$



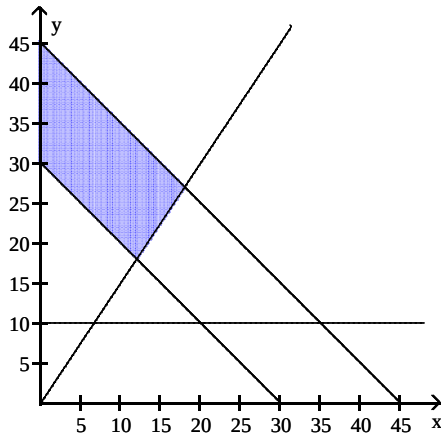
B) $30 \le x + y \le 45$, $y \ge 10$, $x \le \frac{3}{2}y$, $x \ge 10$



C) $30 \le x + y \le 45$, $y \ge 10$, $y \le \frac{3}{2}x$, $x \ge 0$



D) $30 \le x + y \le 45$, $y \ge 10$, $y \ge \frac{3}{2}x$, $x \ge 0$



9) The Acme Class Ring Company designs and sells two types of rings: the VIP and the SST. They can produce up to 24 rings each day using up to 60 total man–hours of labor. It takes 3 man–hours to make one VIP ring and 2 man–hours to make one SST ring. How many of each type of ring should be made daily to maximize the company's profit, if the profit on a VIP ring is $30 and on an SST ring is $40? 9) _____

A) 16 VIP and 8 SST
B) 8 VIP and 16 SST
C) 0 VIP and 24 SST
D) 12 VIP and 12 SST

10) Zach is planning to invest up to $50,000 in corporate and municipal bonds. The least he will invest in corporate bonds is $8000 and he does not want to invest more than $29,000 in corporate bonds. He also does not want to invest more than $32,127 in municipal bonds. The interest is 7.9% on corporate bonds and 6.7% on municipal bonds. This is simple interest for one year. What is the maximum value of his investment after one year? 10) _____

A) $24,698 B) $53,698 C) $32,698 D) $8884

11) Suppose an animal feed to be mixed from soybean meal and oats must contain at least 100 lb of protein, 20 lb of fat, and 12 lb of mineral ash. Each 100−lb sack of soybean meal costs $20 and contains 50 lb of protein, 10 lb of fat, and 8 lb of mineral ash. Each 100−lb sack of alfalfa costs $11 and contains 30 lb of protein, 8 lb of fat, and 3 lb of mineral ash. How many sacks of each should be used to satisfy the minimum requirements at minimum cost? 11) _____

A) 2 sacks of soybeans and 0 sacks of alfalfa

B) $\frac{18}{17}$ sacks of soybeans and $\frac{20}{17}$ sacks of alfalfa

C) $\frac{2}{3}$ sacks of soybeans and $\frac{20}{9}$ sacks of alfalfa

D) 0 sacks of soybeans and 2 sacks of alfalfa

12) Pivot once about the circled element in the simplex tableau, and read the solution from the result. 12) _____

x_1	x_2	x_3	s_1	s_2	z	
1	0	(2)	0	4	0	10
0	1	4	3	2	0	13
0	0	2	−4	0	1	0

A) $x_3 = 5$, $x_2 = -7$, $z = 10$; x_1, s_1, $s_2 = 0$

B) $x_3 = 10$, $x_2 = 10$, $z = 7$; x_1, s_1, $s_2 = 0$

C) $x_3 = 10$, $x_2 = 7$, $z = 10$; x_1, s_1, $s_2 = 0$

D) $x_3 = 5$, $x_2 = -7$, $z = -10$; x_1, s_1, $s_2 = 0$

13) Pivot once about the circled element in the simplex tableau, and read the solution from the result. 13) _____

x_1	x_2	x_3	s_1	s_2	s_3	z	
1	2	(1)	1	0	0	0	14
2	2	3	0	1	0	0	36
4	1	1	0	0	1	0	18
-2	-1	-3	0	0	0	1	0

A) $x_3 = 14$, $s_2 = 12$, $s_3 = -4$, $z = 42$; $x_1, x_2, s_1 = 0$
B) $x_3 = 14$, $s_2 = -12$, $s_3 = 4$, $z = -42$; $x_1, x_2, s_1 = 0$
C) $x_3 = 14$, $s_2 = -6$, $s_3 = 4$, $z = 42$; $x_1, x_2, s_1 = 0$
D) $x_3 = 14$, $s_2 = 12$, $s_3 = 4$, $z = 42$; $x_1, x_2, s_1 = 0$

14) A political mailing will have several pages on the economy, the military, and the environment. The total number of these pages in the booklet should be less than 100. For the target group that will receive the booklet, market research suggests that there will be a positive impact proportional to 5 times the number of pages on the economy, a positive impact proportional to 2 times the number of pages on the military, and a negative impact proportional to −4 times the number of pages on the environment. The candidate, however, insists that the number of pages on the environment exceed the number on the military by at least 5 and that the number of pages on the economy also exceed the number on the military by at least 5. Find the number of pages that should be devoted to the economy, the military, and the environment. 14) _____

A) 30, 30, 30 B) 10, 30, 59 C) 10, 55, 16 D) 44, 25, 30

A manufacturing company wants to maximize profits on products A, B, and C. The profit margin is $3 for A, $6 for B, and $15 for C. The production requirements and departmental capacities are as follows:

Department	**Production requirement by product (hours)**			**Departmental capacity (Total hours)**
	A	**B**	**C**	
Assembling	**2**	**3**	**2**	**30,000**
Painting	**1**	**2**	**2**	**38,000**
Finishing	**2**	**3**	**1**	**28,000**

15) What is the constraint for the finishing department? 15) _____

A) $2A + 3B + C \leq 28{,}000$ B) $2A + 3B + 2C \geq 30{,}000$
C) $A + 2B + 2C \leq 38{,}000$ D) $2A + 3B + C \geq 28{,}000$

16) State the dual problem. Use y_1, y_2, y_3 and y_4 as the variables. Given: $y_1 \geq 0$, $y_2 \geq 0$, $y_3 \geq 0$, and $y_4 \geq 0$. 16) _____

Maximize $z = 3x_1 + 2x_2$

subject to: $x_1 + x_2 \leq 25$

$2x_1 + x_2 \leq 29$

$x_1 \geq 0, x_2 \geq 0$

A) Minimize $w = 25y_1 + 29y_2$
subject to: $y_1 + 2y_2 \leq 3$
$y_1 + y_2 \leq 2$

B) Minimize $w = 29y_1 + 25y_2$
subject to: $2y_1 + y_2 \leq 3$
$y_1 + y_2 \leq 2$

C) Minimize $w = 29y_1 + 25y_2$
subject to: $2y_1 + y_2 \geq 3$
$y_1 + y_2 \geq 2$

D) Minimize $w = 25y_1 + 29y_2$
subject to: $y_1 + 2y_2 \geq 3$
$y_1 + y_2 \geq 2$

17) Use the simplex method to solve the linear programming problem. 17) _____

Minimize $w = 5y_1 + 2y_2$

subject to: $y_1 + y_2 \geq 19.5$

$2y_1 + y_2 \geq 24$

$y_1 \geq 0, y_2 \geq 0$

A) 30.5 when $y_1 = 4.5$ and $y_2 = 0$

B) 54 when $y_1 = 24$ and $y_2 = 1$

C) 31.5 when $y_1 = 1$ and $y_2 = 2$

D) 48 when $y_1 = 0$ and $y_2 = 24$

Answer Key
Testname: FINITE_PRACTICE 1

1) B
2) A
3) C
4) A
5) C
6) A
7) A
8) C
9) C
10) B
11) C
12) D
13) C
14) D
15) A
16) D
17) D