PROBLEM 1

max Z = 2x1 + 20x2 - 10x3

2x1 + 20x2 + 4x3 <= 15

6x1 + 20x2 + 4x3 = 20

x1,x2,x3>=0 ve tamsayı olduğuna göre optimal tablosu verilmiş olan problemi kesme düzlemi algoritmasıyla çözünüz.

Z	X1	X2	X3	S1	A1	
	0	0	14	1	M	15
X2	0	1	0.2	0.075	-0.025	0.625
X1	1	0	0	-0.25	0.25	1.25

0.625=X2+0.2X3+0.075S1

-0.625=S4-0.2X3-0.075S1 (CUT 1)

Z	X1	X2	X3	S1	S4	
	0	0	14	1	0	15
X2	0	1	0.2	0.075	0	0.625
X1	1	0	0	-0.25	0	1.25
S4	0	0	-0.2	-0.075	1	-0.625

Z	X1	X2	X3	S1	**S4**	
	0	0	11.3	0	**13.3**	6.67
X2	0	1	0	0	**-3.33**	0
X1	1	0	0.67	1	**-13.3**	3.3
S1	**0**	**0**	**2.67**	**0**	**13.3**	**8.3**

-0.33=S5-0.67X3-0.67S3 (CUT 2)

Z	X1	X2	X3	S1	S3	S4	
	0	0	0	0	2	17	1
X2	0	1	0	0	1	0	0
X1	1	0	0	0	-4	1	3
S1	0	0	0	1	-16	4	7
X3	0	0	1	0	1	-1.5	0.5

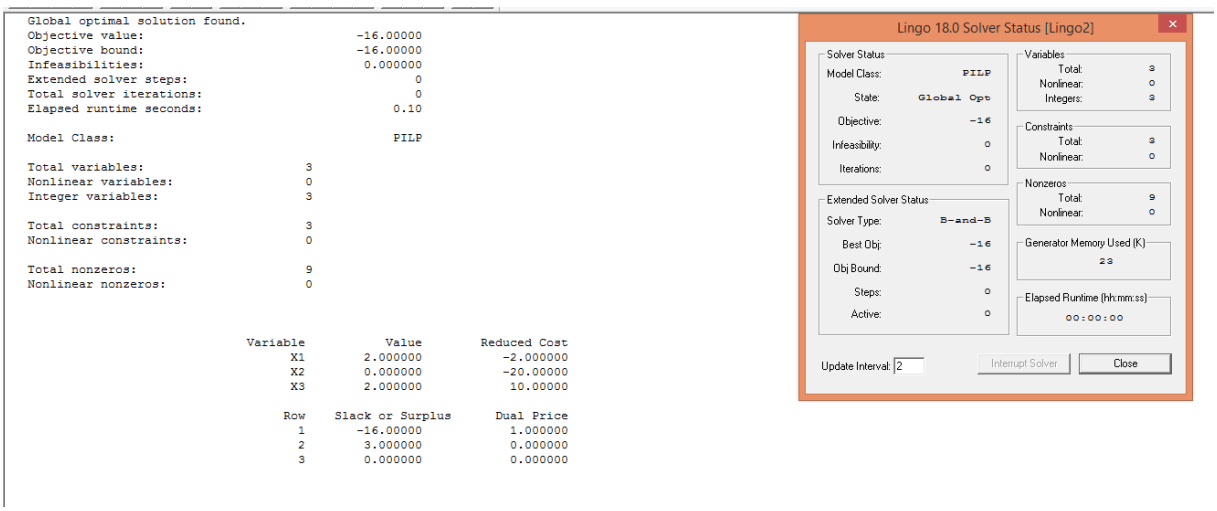
-0.5=S5-0.5S4(CUT 3)

Z	X1	X2	X3	S1	S3	S4	S5	-16
	0	0	0	0	2	0	34	0
X2	0	1	0	0	-4	0	0	2
X1	1	0	0	0	-16	0	2	3
S1	0	0	0	1	1	0	8	2
X3	0	0	1	0	0	1	-3	1

X1=2,X2=0,X3=2 MAX Z=-16

Problem 1 Lingo Çözümü

```
max = 2*x1 + 20*x2 - 10*x3;

2*x1 + 20*x2 + 4*x3 <= 15;

6*x1 + 20*x2 + 4*x3 = 20;

@GIN(X1);

@GIN(X2);

@GIN(X3);

END
```



```
Global optimal solution found.
Objective value:                              -16.00000
Objective bound:                              -16.00000
Infeasibilities:                              0.000000
Extended solver steps:                               0
Total solver iterations:                             0
Elapsed runtime seconds:                          0.10

Model Class:                                      PILP

Total variables:                     3
Nonlinear variables:                 0
Integer variables:                   3

Total constraints:                   3
Nonlinear constraints:               0

Total nonzeros:                      9
Nonlinear nonzeros:                  0


                     Variable           Value        Reduced Cost
                           X1        2.000000           -2.000000
                           X2        0.000000           -20.00000
                           X3        2.000000            10.00000

                          Row    Slack or Surplus      Dual Price
                            1          -16.00000            1.000000
                            2           3.000000            0.000000
                            3           0.000000            0.000000
```

PROBLEM 2

Enb z=8x1+5x2

9x1+5x2=<45

x1+x2=<6

X1,X2>=0 ve tamsayı optimal çözüm tablosu verilmiş olan problemi kesme düzlemi yöntemiyle çözünüz.

	x_1	x_2	S_1	S_2	
	0	0	0.75	1.25	41.25
x_1	1	0	0.25	-1.25	3.75
x_2	0	1	-0.25	2.25	2.25

-0.75=s3-0.25s1-0.75s2

Iteration-1						
B	***x1***	***x2***	***S1***	***S2***	***S3***	***Z*=41.25**
Z	0	0	0.75	1.25	0	
x1	1	0	0.25	-1.25	0	3.75
x2	0	1	-0.25	2.25	0	2.25
S3	0	0	-0.25	**(-0.75)**	1	-0.75
	---	---	-3	-1.6667↑	---	

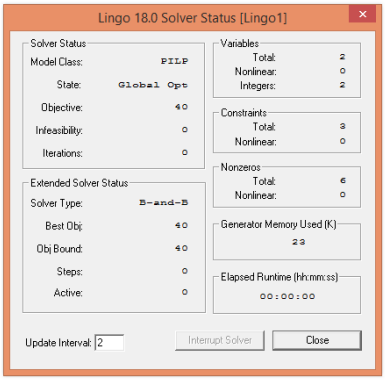
Iteration-2						
	x1	***x2***	***S1***	***S2***	***S3***	
Z	**8**	**5**	**0.3333**	**0**	**1.6667**	***40***
x1	1	0	0.6667	0	-1.6667	8
x2	0	1	-1	0	3	5
S2	0	0	0.3333	1	-1.3333	0

X1=5 x2=0 Max z=40

Problem 2 Lingo Çözümü

```
max=8*x1+5*x2 ;

9*x1+5*x2<=45;

x1+x2<=6;

@gin(x1);
@gin(x2);
end
```

```
Global optimal solution found.
Objective value:                              40.00000
Objective bound:                              40.00000
Infeasibilities:                              0.000000
Extended solver steps:                               0
Total solver iterations:                             0
Elapsed runtime seconds:                          0.07

Model Class:                                      PILP

Total variables:                       2
Nonlinear variables:                   0
Integer variables:                     2

Total constraints:                     3
Nonlinear constraints:                 0

Total nonzeros:                        6
Nonlinear nonzeros:                    0

                     Variable           Value        Reduced Cost
                           X1        5.000000           -8.000000
                           X2        0.000000           -5.000000

                          Row    Slack or Surplus      Dual Price
                            1        40.00000            1.000000
                            2        0.000000            0.000000
                            3        1.000000            0.000000
```



PROBLEM 3

MAX z = 2 x1+ x2

5 x1 + 2 x2 <= 8

x1+ x2<= 3

x1, x2 . 0; x1 tamsayı optimal tablosu verilmiş olan problemi kesme düzlemi algoritmasıyla çözünüz.

	x_1	x_2	S_1	S_2	
Z	**2**	**1**	**0.3333**	**0.3333**	**3.6667**
x_1	1	0	0.3333	-0.6667	0.6667
x_2	0	1	-0.3333	1.6667	2.3333

0.6667=x1+0.3333s1-0.6667s2

0.6667=x1+0.3333s1+(-1+0.3333)

-0.6667=s3-0.33333s1-0.33333s2 (cut 1)

	$x1$	$x2$	$S1$	$S2$	$S3$	
z	0	0	0	0	1	**3**
$x1$	1	0	0	-1	1	2
$x2$	0	1	0	2	-1	1
$S1$	0	0	1	1	-3	0

X1=0,x2=3 max z=3

PROBLEM 3 LİNGO ÇÖZÜMÜ

MAX = 2 *x1+ x2;

5 *x1 + 2 *x2 <= 8;

x1+ x2<= 3 ;

```
@gin(x1);
@gin(x2);
end
```

```
Global optimal solution found.
Objective value:                              3.000000
Objective bound:                              3.000000
Infeasibilities:                              0.000000
Extended solver steps:                               0
Total solver iterations:                             0
Elapsed runtime seconds:                          0.04

Model Class:                                      PILP

Total variables:                     2
Nonlinear variables:                 0
Integer variables:                   2

Total constraints:                   3
Nonlinear constraints:               0

Total nonzeros:                      6
Nonlinear nonzeros:                  0


                     Variable           Value        Reduced Cost
                           X1        1.000000           -2.000000
                           X2        1.000000           -1.000000

                          Row    Slack or Surplus      Dual Price
                            1        3.000000            1.000000
                            2        1.000000            0.000000
                            3        1.000000            0.000000
```