Homework 10

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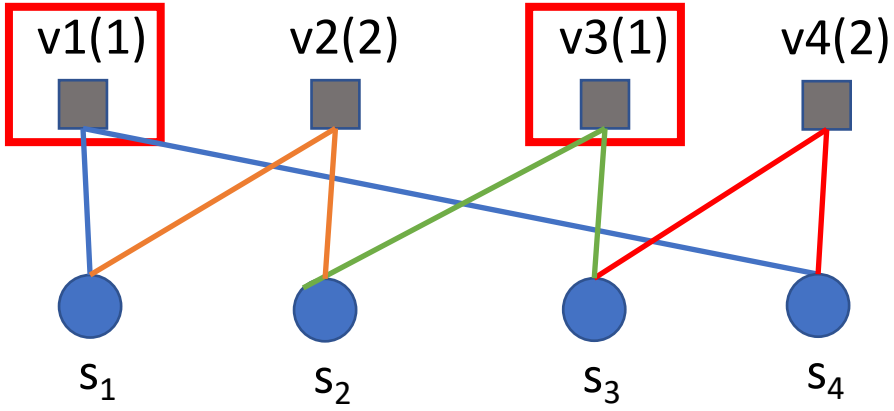
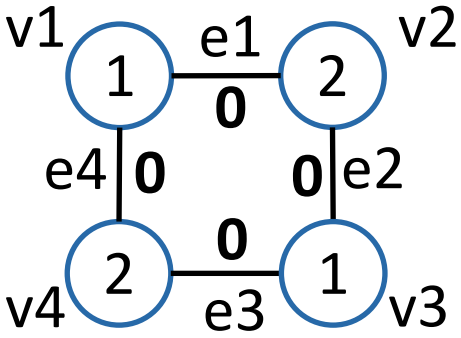
Exercise 8-2

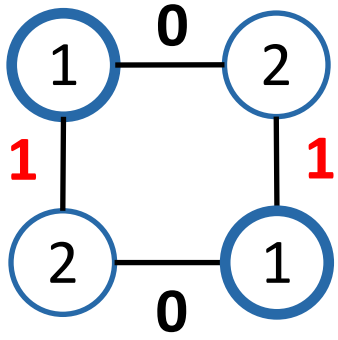
- Create an example for which the best solution is obtained from the greedy set cover algorithm

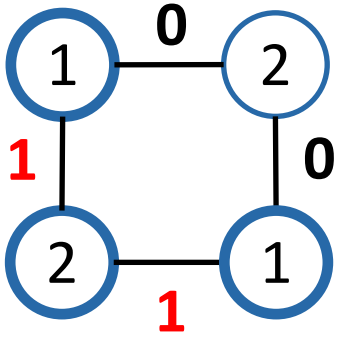
The greedy set cover algorithm *S={v1,v3},w(S)=2*



The pricing method *S={v1,v3},w(S)=2;S={v1,v3,v4},w(S)=4*







Exercise 8-2

- Create an example for which the best solution is obtained from the greedy set cover algorithm

The LP-based method *S={v1,v3},w(S)=2*

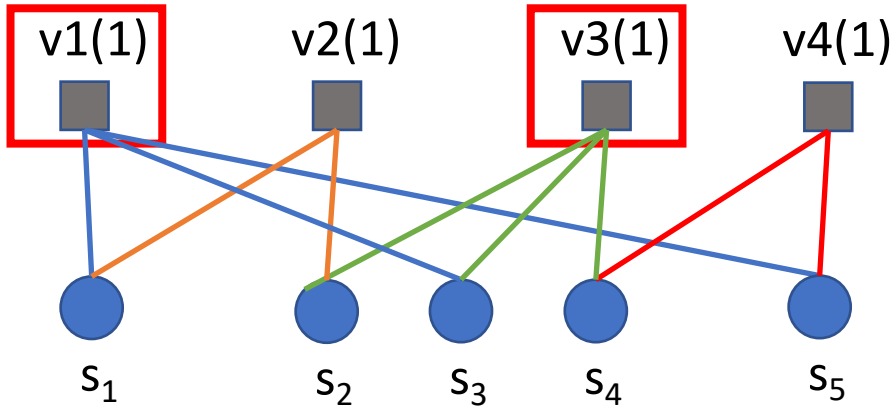
```python
import numpy
from scipy import optimize

c = numpy.array([1,2,1,2])

A_ub = numpy.array([[-1,-1,0,0],[0,-1,-1,0],[0,0,-1,-1],[-1,0,0,-1]])
b_ub = numpy.array([-1,-1,-1,-1])

res = optimize.linprog(c,A_ub,b_ub)
print(res)
print("Optimal result is",res.fun)
```

```
In [51]: runfile('/Users/apple/Desktop/GitHub/Advanced-algorithm/w10_VC/
w10_ex8-2.py', wdir='/Users/apple/Desktop/GitHub/Advanced-algorithm/w10_VC')
     con: array([], dtype=float64)
     fun: 2.0000000000019735
 message: 'Optimization terminated successfully.'
     nit: 4
   slack: array([3.10862447e-14, 3.10862447e-14, 3.13082893e-14, 3.13082893e-14])
  status: 0
 success: True
       x: array([1.00000000e+00, 9.55522751e-13, 1.00000000e+00, 9.55759519e-13])
Optimal result is 2.0000000000019735
```

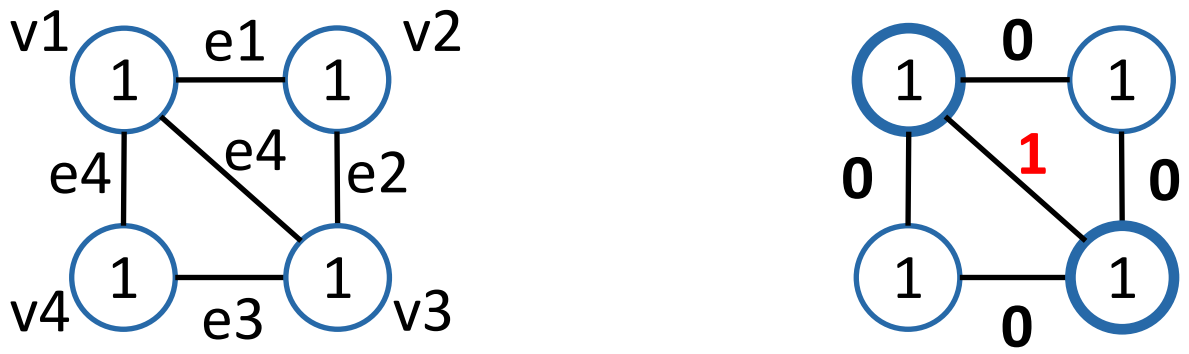
Exercise 8-3

- Create an example for which the best solution is obtained from the pricing method

The greedy set cover algorithm S={v1,v3},w(S)=2



The pricing method S={v1,v3},w(S)=2



Exercise 8-3

- Create an example for which the best solution is obtained from the pricing method

The LP-based method S={v1,v3},w(S)=2

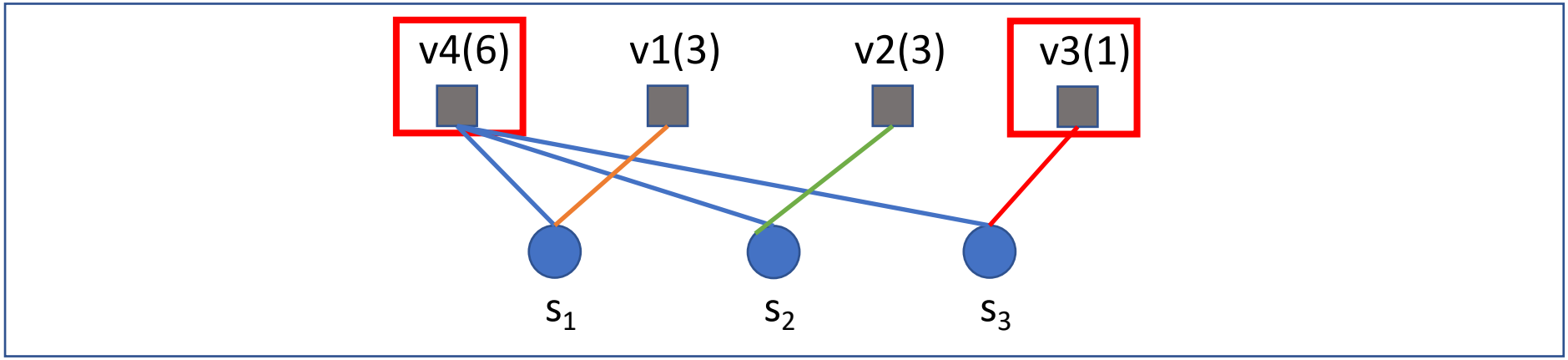
```
1   import numpy
2   from scipy import optimize
3
4   c = numpy.array([1,1,1,1])
5
6   A_ub = numpy.array([[-1,-1,0,0],[0,-1,-1,0],[0,0,-1,-1],[-1,0,0,-1],[-1,0,-1,0]])
7   b_ub = numpy.array([-1,-1,-1,-1,-1])
8
9   res = optimize.linprog(c,A_ub,b_ub)
10  print(res)
11  print("Optimal result is",res.fun)
```

```
In [14]: runfile('/Users/apple/Desktop/GitHub/Advanced-algorithm/w10_VC/
w10_ex8-3.py', wdir='/Users/apple/Desktop/GitHub/Advanced-algorithm/w10_VC')
     con: array([], dtype=float64)
     fun: 2.000000000415934
 message: 'Optimization terminated successfully.'
     nit: 3
   slack: array([2.07966755e-10, 2.07966977e-10, 2.07966977e-10, 2.07966755e-10,
       2.89320205e-01])
  status: 0
 success: True
       x: array([0.6446601, 0.3553399, 0.6446601, 0.3553399])
Optimal result is 2.000000000415934
```

Exercise 8-4

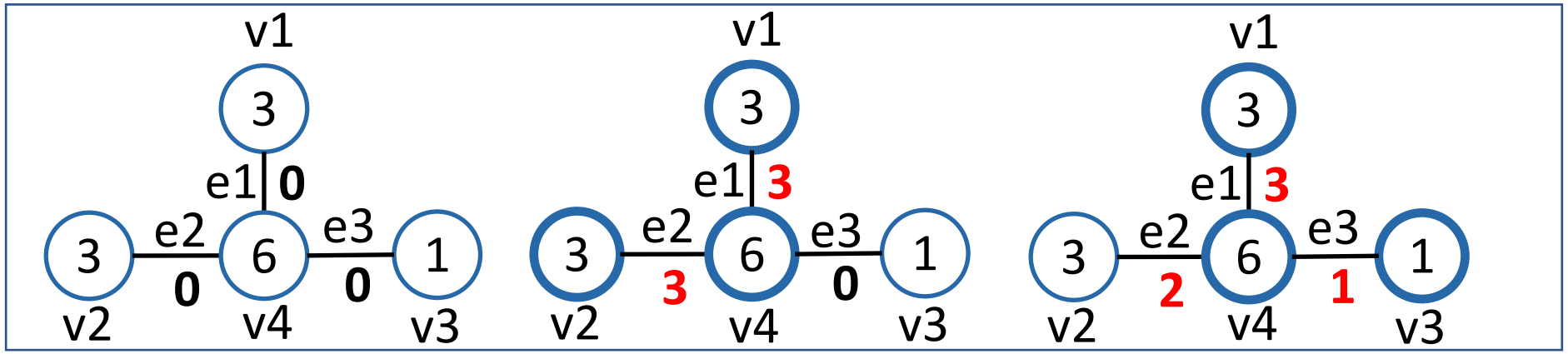
- Create an example for which the best solution is obtained from the LP-based method

The greedy set cover algorithm *S={v3,v4},w(S)=7*



The pricing method *S={v1,v2,v4},w(S)=12*

S={v1,v3,v4},w(S)=10



Exercise 8-4

- Create an example for which the best solution is obtained from the LP-based method

The LP-based method *S={v4},w(S)=6*

```
1  import numpy
2  from scipy import optimize
3
4  c = numpy.array([3,3,1,6])
5
6  A_ub = numpy.array([[-1,0,0,-1],[0,-1,0,-1],[0,0,-1,-1]])
7  b_ub = numpy.array([-1,-1,-1])
8
9  res = optimize.linprog(c,A_ub,b_ub)
10 print(res)
11 print("Optimal result is",res.fun)
```

```
In [58]: runfile('/Users/apple/Desktop/GitHub/Advanced-algorithm/w10_VC/
w10_ex8-4.py', wdir='/Users/apple/Desktop/GitHub/Advanced-algorithm/w10_VC')
     con: array([], dtype=float64)
     fun: 6.000000000003139
 message: 'Optimization terminated successfully.'
     nit: 5
   slack: array([2.32924791e-13, 2.34479103e-13, 7.54951657e-13])
  status: 0
 success: True
       x: array([1.21415963e-12, 1.21580860e-12, 1.73618017e-12, 1.00000000e+00])
Optimal result is 6.000000000003139
```

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Thanks!

Please contact me with email if you have any problem

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