```
##### Problem 5 #####
import numpy as np

A = np.array( [ (3, 7, -4, 12),
                (-5, 9, 10, 2),
                (6, 13, 8, 11),
                (15, 5, 4, 1) ] )

v = A[:,1] # second column of A
print('Vector v: {} consists of values from 2nd column of A'.format(v))

w = A[1,:] # second row of A
print('Vector w: {} consists of values from 2nd row of A'.format(w))
```

```
Vector v: [ 7  9 13  5] consists of values from 2nd column of A
Vector w: [-5  9 10  2] consists of values from 2nd row of A
```

```
##### Problem 6 #####

# create a 4x3 array B of all elements in the 2nd thru 4th columns
B = A[:,1:4]
print('Array B:\n',B)
#C = # create a 3x4 array B of all elements in the 2nd thru 4th rows
C = A[1:4,:]
print('\nArray C:\n',C)
#D = # create a 2x3 of all elements in the first 2 rows and the last 3 columns
D = A[:2,1:]
print('\nArray D:\n',D)
```

```
Array B:
 [[ 7 -4 12]
 [ 9 10  2]
 [13  8 11]
 [ 5  4  1]]

Array C:
 [[-5  9 10  2]
 [ 6 13  8 11]
 [15  5  4  1]]

Array D:
 [[ 7 -4 12]
 [ 9 10  2]]
```

```
##### Problem 7 #####

x = [2,4,7]
y = [2, -4, 7]
z = [5+3j, -3+4j, 2-7j]

xLength = len(x)
xAbs = [abs(i) for i in x]
print('Vector x has length of {} and absolute values are {}'.format(xLength, xAbs))

yLength = len(y)
yAbs = [abs(i) for i in y]
print('Vector y has length of {} and absolute values are {}'.format(yLength, yAbs))

zLength = len(z)
zAbs = [abs(i) for i in z]
print('Vector z has length of {} and absolute values are {}'.format(zLength, zAbs))
```

```
Vector x has length of 3 and absolute values are [2, 4, 7]
Vector y has length of 3 and absolute values are [2, 4, 7]
Vector z has length of 3 and absolute values are [5.830951894845301, 5.0, 7.280109889280518]
```

```
###### Problem 8 #####

# find max in min in each column
for val, column in enumerate(A.T):
  print('column', val, 'max is', column.max(), 'and min is', column.min())

print()
# find max in min in each row
for val, column in enumerate(A):
  print('row', val, 'max is', column.max(), 'and min is', column.min())
```

```
### correction for better way to do
print()
print(A.max(axis=0))
print(A.min(axis=0))
print(A.max(axis=1))
print(A.min(axis=1))
```

```
column 0 max is 15 and min is -5
column 1 max is 13 and min is 5
column 2 max is 10 and min is -4
column 3 max is 12 and min is 1

row 0 max is 12 and min is -4
row 1 max is 10 and min is -5
row 2 max is 13 and min is 6
row 3 max is 15 and min is 1

[15 13 10 12]
[-5  5 -4  1]
[12 10 13 15]
[-4 -5  6  1]
```

```
##### Problem 9 #####

# sort each column and store the result in an array B
B = np.sort(A, axis=0)
print('B:\n', B)

# sort each row and store the result in an array C
C = np.sort(A, axis=1)
print('\nC:\n', C)

# add each column and store the result in an array
D = sum(np.sort(A, axis=0))
print('\nD:\n', D)

# add each row and store the result in an array
E = sum(np.sort(A, axis=1))
print('\nE:\n', E)
```

```
B:
 [[-5  5 -4  1]
 [ 3  7  4  2]
 [ 6  9  8 11]
 [15 13 10 12]]

C:
 [[-4  3  7 12]
 [-5  2  9 10]
 [ 6  8 11 13]
 [ 1  4  5 15]]

D:
 [19 34 18 26]

E:
 [-2 17 32 50]
```

```
##### Problem 10 #####

A = [[1,4,2],
     [2, 4, 100],
     [7, 9, 7],
     [3, np.pi, 42]]

A = np.array(A)

B = np.log(A)

# select just the second row of B
b_row_2 = B[1,:]

print('B:\n', B)
print('\n2nd row of B:\n', b_row_2)
print('\nSum of 2nd row of B:\n', sum(b_row_2)) # evaluate the sum of the second row of B

# multiply the second column of B and the first column of A element by element

c = B[:,1] * A[:,0]
```

```
print('\nVector resulting from element-by-element multiplication')
print('of 2nd Column of B and 1st column of A:\n', c)
# eval the max value in the vector resulting from part c
print('\nMaximum value in vector above:\n', max(c))

e = A[0,:] / B[:3,2]
print('\nVector resulting from element-by-element division')
print('of 1st row of A by 1st 3 elements of 3rd column of B:\n', e)  ### correction
```

```
B:
 [[0.         1.38629436 0.69314718]
 [0.69314718 1.38629436 4.60517019]
 [1.94591015 2.19722458 1.94591015]
 [1.09861229 1.14472989 3.73766962]]

2nd row of B:
 [0.69314718 1.38629436 4.60517019]

Sum of 2nd row of B:
 6.684611727667928

Vector resulting from element-by-element multiplication
of 2nd Column of B and 1st column of A:
 [ 1.38629436  2.77258872 15.38057204  3.43418966]

Maximum value in vector above:
 15.380572041353537

Vector resulting from element-by-element division
of 1st row of A by 1st 3 elements of 3rd column of B:
 [1.44269504 0.86858896 1.02779668]
```

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