Robotic Manipulation HW2 problem 2

Problem 2(i) ¶

In [1]:
```
%run manipulation.py
q = [3,0,0]
s_hat = [0,0,1]
h = 2
ScrewToAxis(q,s_hat,h)
```

Out[1]:
```
array([[ 0],
       [ 0],
       [ 1],
       [ 0],
       [-3],
       [ 2]])
```

Problem 2(ii)

In [2]:
```
S = [0,1/math.sqrt(2),1/math.sqrt(2),1,2,3]
theta = 1
MatrixExp6(S*theta)
```

Out[2]:
```
array([[ 0.54030231, -0.59500984,  0.59500984,  1.16652634],
       [ 0.59500984,  0.77015115,  0.22984885,  2.40431986],
       [-0.59500984,  0.22984885,  0.77015115,  2.59568014],
       [ 0.        ,  0.        ,  0.        ,  1.        ]])
```

Problem 2(iii)

In [5]:
```
T = [[1,0,0,0],[0,0,-1,0],[0,1,0,3],[0,0,0,1]]
MatrixLog6(T)
```

Out[5]:
```
array([[ 1.57079633],
       [ 0.        ],
       [ 0.        ],
       [ 0.        ],
       [ 2.35619449],
       [ 2.35619449]])
```

Problem 2(iv)

In [6]:
```
S1 = array([[0],[0],[1],[4],[0],[0]])
S2 = array([[0],[0],[0],[0],[1],[0]])
S3 = array([[0],[0],[-1],[-6],[0],[-0.1]])
Slist = [S1, S2, S3]
thetalist = [math.pi/2, 3, math.pi]
M = array([[-1,  0,  0,  0],
           [ 0,  1,  0,  6],
           [ 0,  0, -1,  2],
           [ 0,  0,  0,  1]])
FKinFixed(M,Slist,thetalist)
```

Out[6]:
```
array([[ -1.14423775e-17,   1.00000000e+00,   0.00000000e+00,
         -5.00000000e+00],
       [  1.00000000e+00,   1.14423775e-17,   0.00000000e+00,
          4.00000000e+00],
       [  0.00000000e+00,   0.00000000e+00,  -1.00000000e+00,
          1.68584073e+00],
       [  0.00000000e+00,   0.00000000e+00,   0.00000000e+00,
          1.00000000e+00]])
```

Problem 2(v)

In [8]:
```
S1b = array([[0],[0],[-1],[2],[0],[0]])
S2b = array([[0],[0],[0],[0],[1],[0]])
S3b = array([[0],[0],[1],[0],[0],[0.1]])
Sblist = [S1b, S2b, S3b]
thetalist = [math.pi/2, 3, math.pi]
M = array([[-1,  0,  0,  0],
           [ 0,  1,  0,  6],
           [ 0,  0, -1,  2],
           [ 0,  0,  0,  1]])
FKinBody(M,Sblist,thetalist)
```

Out[8]:
```
array([[ -1.14423775e-17,   1.00000000e+00,   0.00000000e+00,
         -5.00000000e+00],
       [  1.00000000e+00,   1.14423775e-17,   0.00000000e+00,
          4.00000000e+00],
       [  0.00000000e+00,   0.00000000e+00,  -1.00000000e+00,
          1.68584073e+00],
       [  0.00000000e+00,   0.00000000e+00,   0.00000000e+00,
          1.00000000e+00]])
```