Stress Problem Solutions

Problems 2.3.2, 2.3.4
(a) principal stresses, principal stress directions (in columns)

```
     0        0        0
     0   82.0820       0
     0        0  -52.0820

1.0000        0        0
     0   0.9732   0.2298
     0   0.2298  -0.9732
```

(b)

```
 -12.8700        0        0
     0  127.6509        0
     0        0 -194.7809

  0.7870   0.0807   0.6116
 -0.4232   0.7919   0.4402
  0.4488   0.6053  -0.6574
```

(c)

```
 114.1429        0        0
     0   68.4014        0
     0        0 -162.5443

  0.3077  -0.9102  -0.2771
 -0.9247  -0.2176  -0.3123
 -0.2239  -0.3523   0.9087
```

(d)

```
 297.0899        0        0
     0   99.5966        0
     0        0 -176.6865

  0.8033  -0.4295  -0.4126
 -0.5853  -0.6974  -0.4136
  0.1102  -0.5737   0.8116
```

(e) – note this is a stress state where I3=0 so you can solve for the principal stresses with the quadratic formula

22.3607 0 0
0 0.0000 0
0 0 -22.3607

0.6325 -0.4472 -0.6325
0.7071 0.0000 0.7071
0.3162 0.8944 -0.3162

(f)

-55.2438 0 0
0 -19.4004 0
0 0 74.6442

0.7547 0.0837 0.6507
-0.3443 -0.7937 0.5015
-0.5584 0.6025 0.5702

(g) see class discussion

-100.0000 0 0
0 200.0000 0
0 0 -100.0000

0.7071 0.5774 0.4082
-0.7071 0.5774 0.4082
0 0.5774 -0.8165

Problem 3

normal stress = 74.6 MPa

total shear stress = 19 MPa

total shear stress direction = 0.0779
0.8681
-0.4791

Problem 4

normal stress = 12 MPa
shear stress = 9.31 MPa

Problem 5

60.0000	14.6410	-54.6410
14.6410	-12.3205	-1.3397
-54.6410	-1.3397	32.3205

Problem 6

max shear stress = 11.1 MPa