

## 2.3.2, 2.3.4 (a)

```
>> stress = [ 0  0  0;
              0 75 30;
              0 30 -45];
```

```
>> IO = stress_invs(stress) ←
```

IO =

```
    30   -4275     0
```

```
>> [pdirs pvals] = eig(stress)
```

pdirs =

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

pvals =

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

stress invariants

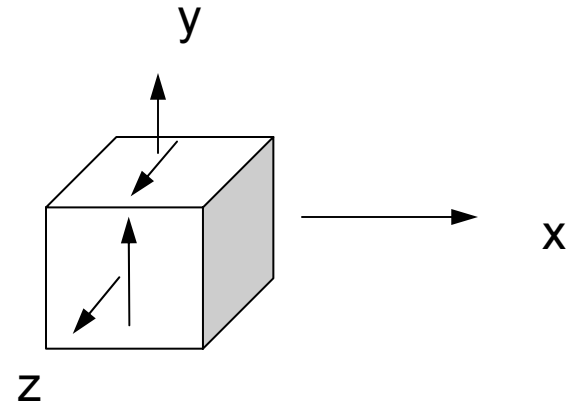
```
function IO = stress_invs(s)
```

```
I1 = trace(s);
```

```
I2 = s(1,1)*s(2,2) - s(1,2)^2 + s(1,1)*s(3,3) - s(1,3)^2 ...
      + s(2,2)*s(3,3) - s(2,3)^2;
```

```
I3 = det(s);
```

```
IO = [ I1,I2,I3];
```



initially a principal value  
(2-D plane stress in y-z plane)

part (b)

```
>> stress = [-80 -40 80; -40 40 120; 80 120 -40]
```

```
stress =
```

```
-80 -40 80  
-40 40 120  
80 120 -40
```

```
>> [I1, I2, I3] = stress_invs(stress)
```

```
I1 = -80
```

```
I2 = -24000
```

```
I3 = 320000
```

```
>> [pdirs, pstress] = eig(stress)
```

```
pdirs =
```

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

```
pstress =
```

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

part (c)

```
>> stress = [ 55 -33 55;  
             -33 85 75;  
             55 75 -120];
```

```
>> I = stress_inv(sstress)
```

I =

```
      20   -21864  -1269070
```

```
>> [pdirs pvals] = eig(stress)
```

pdirs =

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

pvals =

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

part (d)

```
>> stress = [ 180 -140 110;  
             -140 120  80;  
             110  80 -80];  
>> I = stress_invs(stress)
```

I =

```
      220   -40500  -5228000
```

```
>> [pdirs pvals] = eig(stress)
```

pdirs =

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

pvals =

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

part (e)

```
>> stress = [ 0 20 0;  
             20 0 10;  
             0 10 0];
```

```
>> I = stress_invs(stress)
```

I =

```
0 -500 0 ←
```

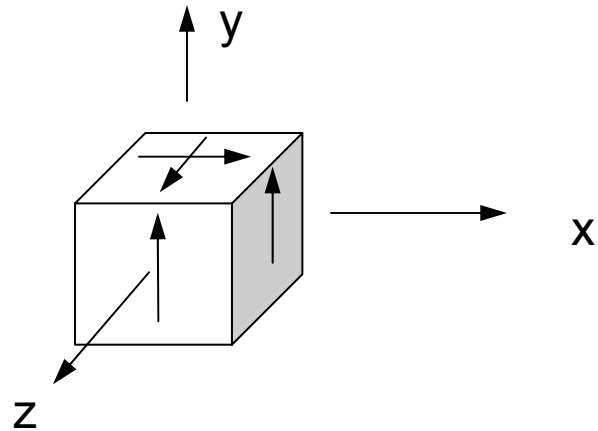
```
>> [pds pvs] = eig(stress)
```

pds =

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

pvs =

```
-22.3607 0 0  
0 -0.0000 0  
0 0 22.3607
```



$I_3 = 0$  case, can solve for principal stresses as in 2-D plane stress case, but this is not plane stress

part (f)

```
>> stress =      [ 0 40 50;  
                  40  0 20;  
                  50 20  0];
```

```
>> I = stress_inv(stress)
```

```
I =
```

```
      0   -4500   80000
```

```
>> [pds pvs] = eig(stress)
```

```
pds =
```

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

```
pvs =
```

```
 -55.2438     0     0  
   0 -19.4004     0  
   0     0 74.6442
```

## part (g)

```
>> stress =[ 0 100 100;  
            100 0 100;  
            100 100 0];
```

```
>> I = stress_inv(stress)
```

```
I =
```

```
0 -30000 2000000
```

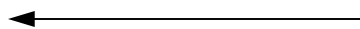
```
>> [pds pvs] = eig(stress)
```

```
pds =
```

```
0.4082 0.7071 0.5774  
0.4082 -0.7071 0.5774  
-0.8165 0 0.5774
```

```
pvs =
```

```
-100.0000 0 0  
0 -100.0000 0  
0 0 200.0000
```



two principal stresses the same, so any two directions perpendicular to  $\mathbf{n} = [0.5774 \ 0.5774 \ 0.5774]$  has this same stress