Please state clearly all assumptions made in order for full credit to be given.

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Problem #1 (10 %)

Given the following information about the system:

\[ r_{a/o} = OA = \hat{i} + \hat{j} + 6\hat{k} \]
\[ F_a = 900\hat{k} \]
\[ r_{b/o} = OB = 3\hat{i} + 4\hat{j} - 7\hat{k} \]
\[ F_b = 900\hat{i} + 900\hat{j} \]

The MATLAB code was generated to determine the moment \( M_o \) about point O.

```matlab
r_ao=[1 -1 6];
F_a=[0 0 900];
r_bo=[3 4 -7];
F_b=[900 900 0];
M_o=cross(F_a,r_ao)+cross(F_b,r_bo)
```

The answer for the moment is not correct! Rewrite the 5 lines of Matlab code correcting what is wrong.
Problem #2 (25 %)

Consider the following matrix

\[
A = \begin{bmatrix}
5 & 0 & 0 & 1 \\
0 & 4 & 0 & 2 \\
0 & 0 & 3 & 0 \\
0 & 0 & 3 & 2 \\
0 & 0 & 0 & 2 \\
\end{bmatrix}
\]

a) Use the method of cofactor expansion to find \( \det (A) \) (10 points)

b) Use the method of matrix inversion to invert the bold-faced 3x3 matrix of rows 3,0,3; 3,2,0; and 0,2,1 (15 points)
Problem #3 (20%)

A sign weighing 50 lb, with its mass center at $G$, is supported by the rod $ABD$. The collar at $A$ is smooth meaning the collar experiences no force in the z-direction. Determine:

a) The tension in cable $BC$ (7)
b) The tension in cable $DE$ (7)
c) The reaction on the smooth collar $A$ (6)

Note: You have to draw any required FBD and show all work to receive full credit.
Problem #4 (25 %)

The truss shown is supported at A by a smooth pin and at G by a smooth roller.

a) Using the method of joints, determine the force in members DE and EF and state whether the members are in tension or compression (10 points)

b) Using the method of sections, determine the force in members BC, BG, and GH and state whether they are in tension or compression (15 points)

Note: You have to draw all needed FBD you are using in a) and b) to get full credit.
Problem #5 (20%)

A force $F = 50 lb$ is applied when the mechanism is the position shown. Determine:

a) The force $P$ to maintain equilibrium (4)
b) The reaction at $B$ (4)
c) Reaction at $D$ (4)
d) The reaction at $C$ (4)
e) The reaction at $A$ (4)

Note: You have to draw any required FBD and show all work to receive full credit

a.

b.

c.

d.

e.