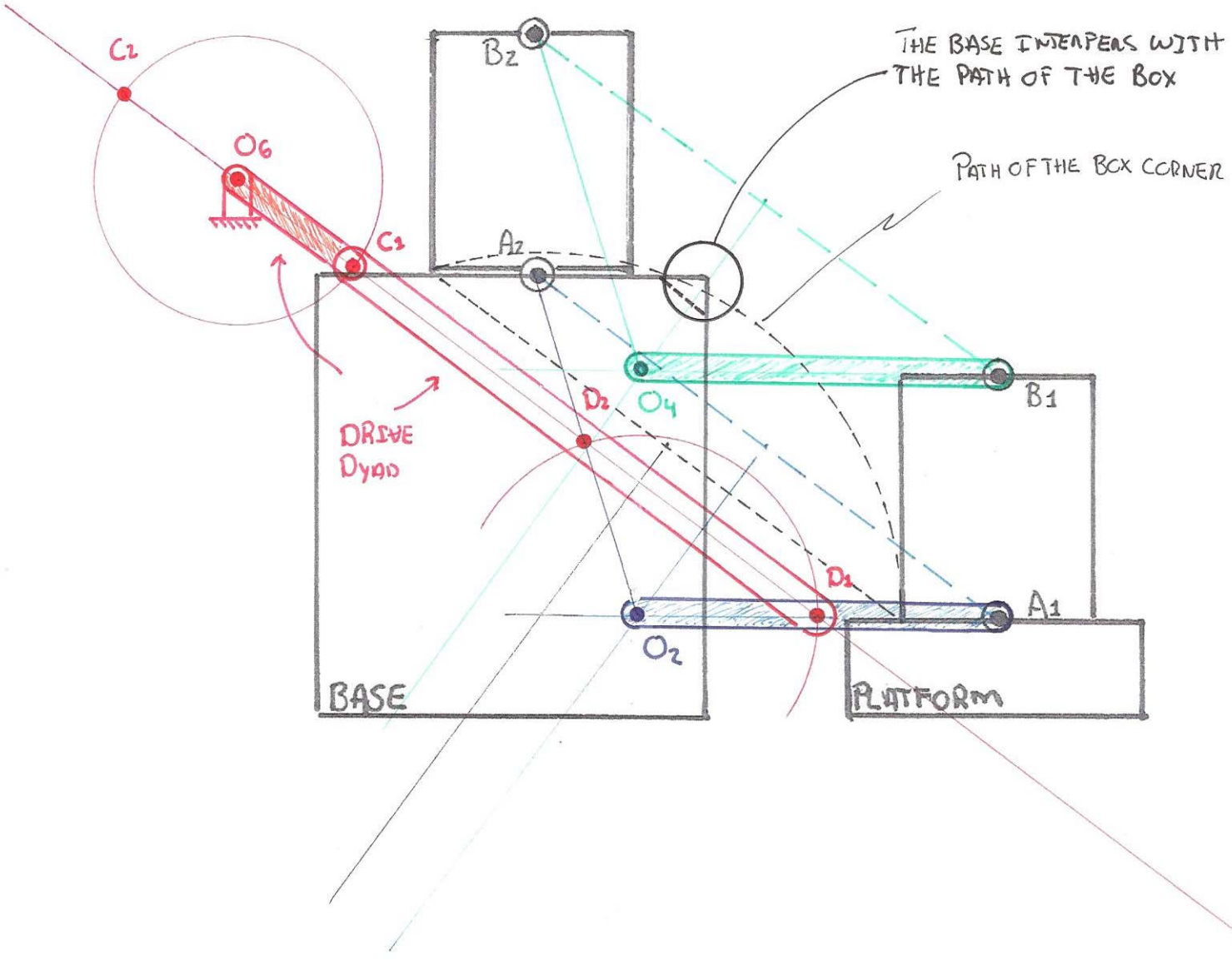
NAME: SOLUTION

PROBLEM 1 (30 pts): A box sits on top of the base and needs to be moved to the platform without changing the orientation of the box. To accomplish this ground pivots have to be located on the box that are vertical to each other and have the same spacing as A and B.

1a. Using graphical methods locate the position of the ground pivots and draw the mechanism that will accomplish the task on the figure below.



1b. Draw a drive dyad off the link that connects the ground with point A.

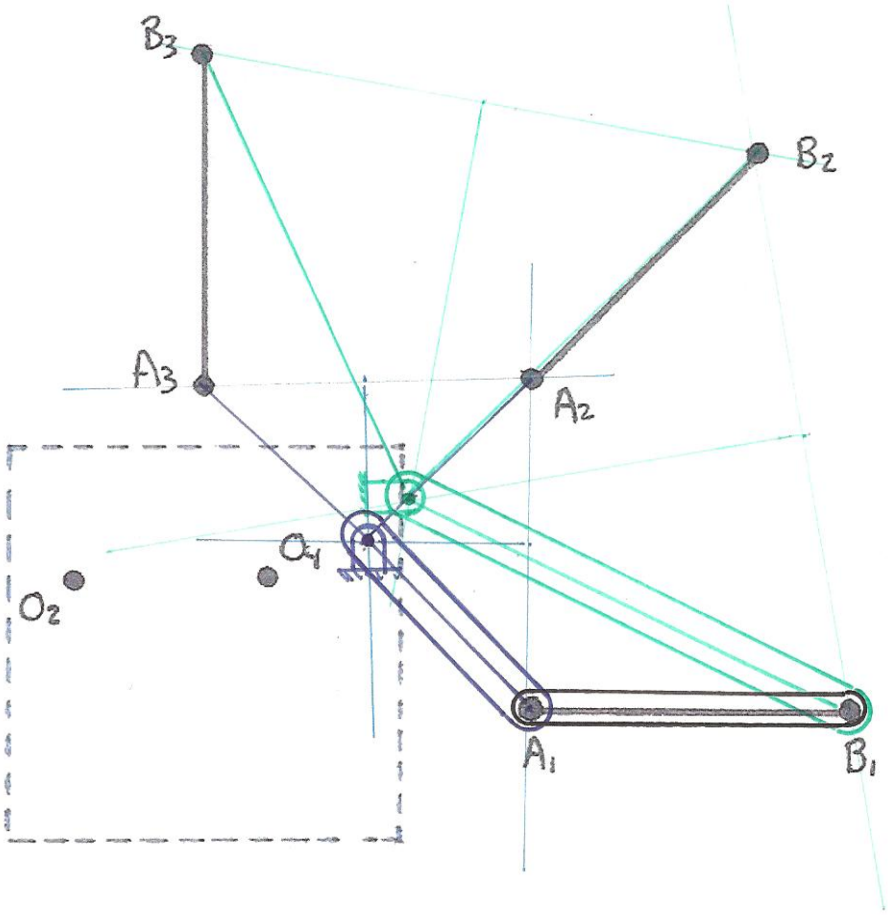
1c. Will the upper right hand corner of the base interfere with the motion of the box? If it does, suggest modifications to the problem that will resolve the issue.

THE PATH OF THE LOWER LEFT HAND CORNER OF THE BOX THAT IS DRAWN ON THE PREVIOUS FIGURE INDICATES THAT THE BASE DOES INTERFER WITH THE PATH OF THE BOX.

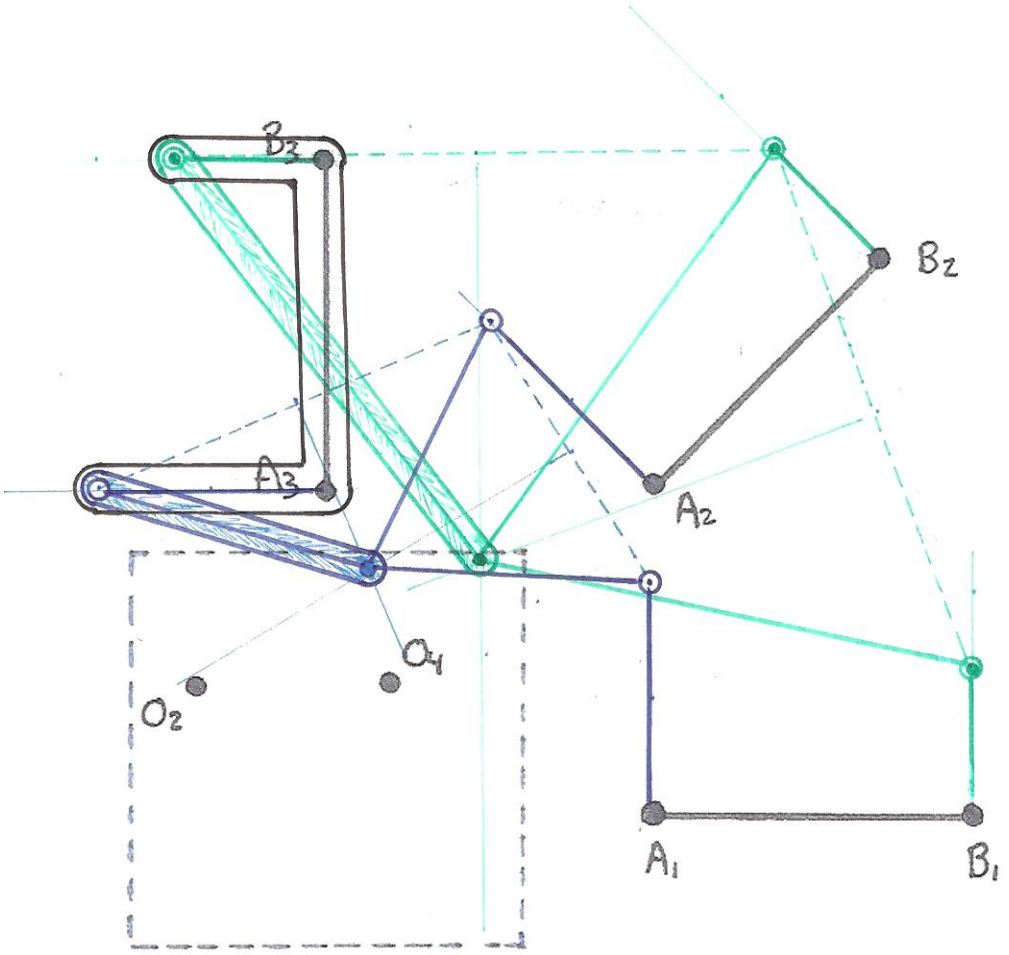
THIS CONDITION CAN BE RESOLVED BY PLACING AN APPROPRIATE SIZED CHAMFER ON THE UPPER RIGHT HAND CORNER OF THE BOX.

PROBLEM 2 (40 pts): The figure below illustrates three positions of a mechanism that needs to be synthesized.

2a. Using three position synthesis for the case of moving pivots, locate the position of the ground pivots on the figure below.



2b. It is desired to synthesize the location of ground pivots that are located within the dashed area shown in the figure below. Use three position synthesis with alternate moving pivots to synthesize the location of the ground pivots within the specified area or synthesize a mechanism that uses the two ground pivot locations shown.



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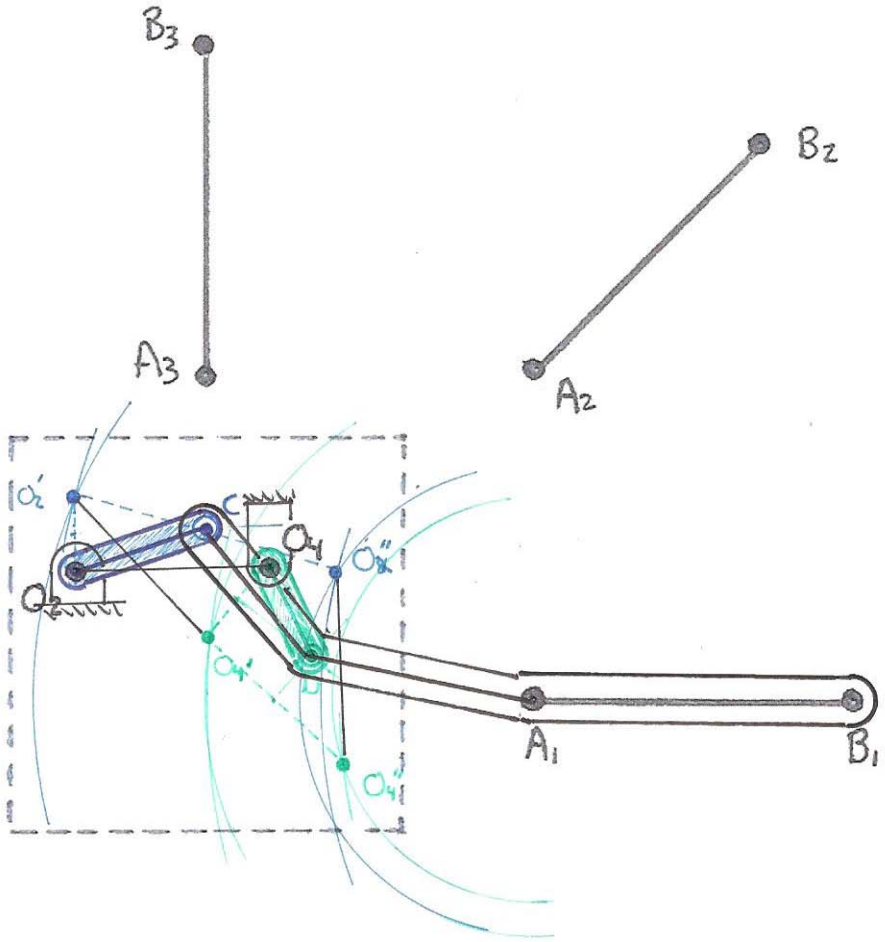

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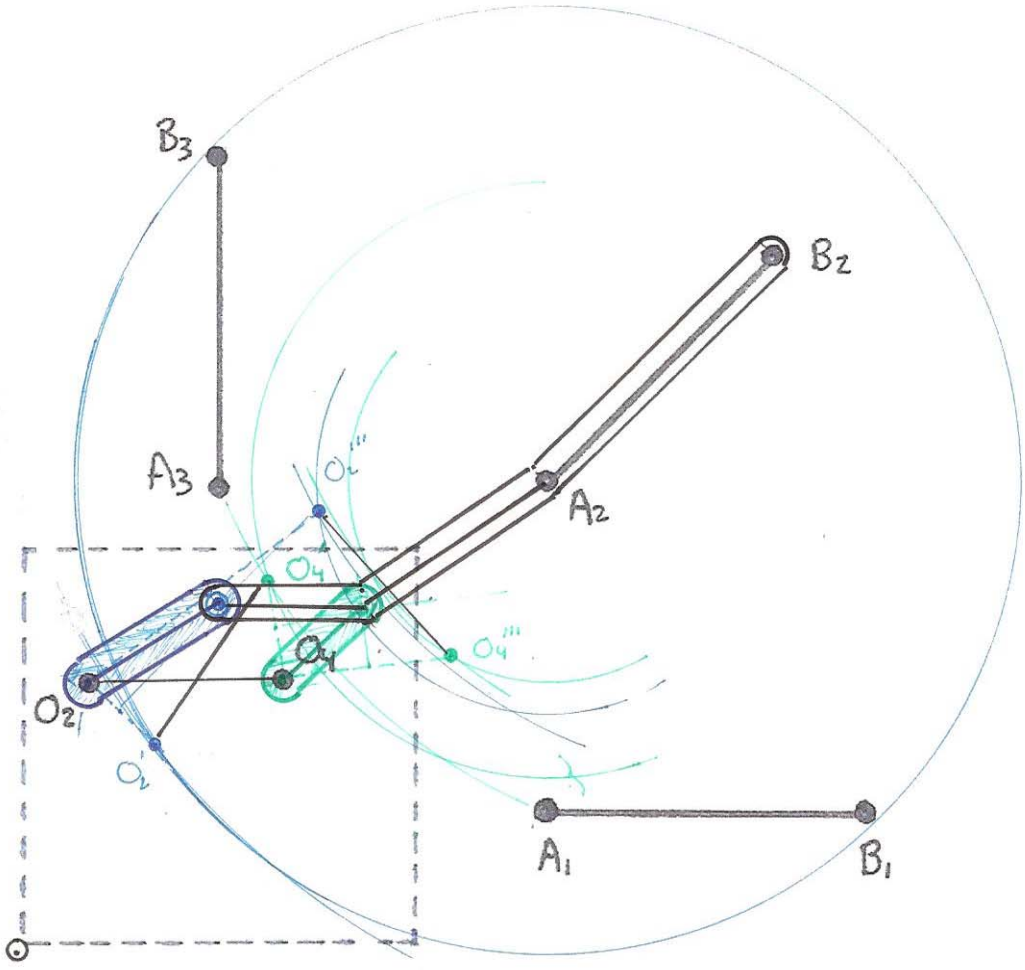

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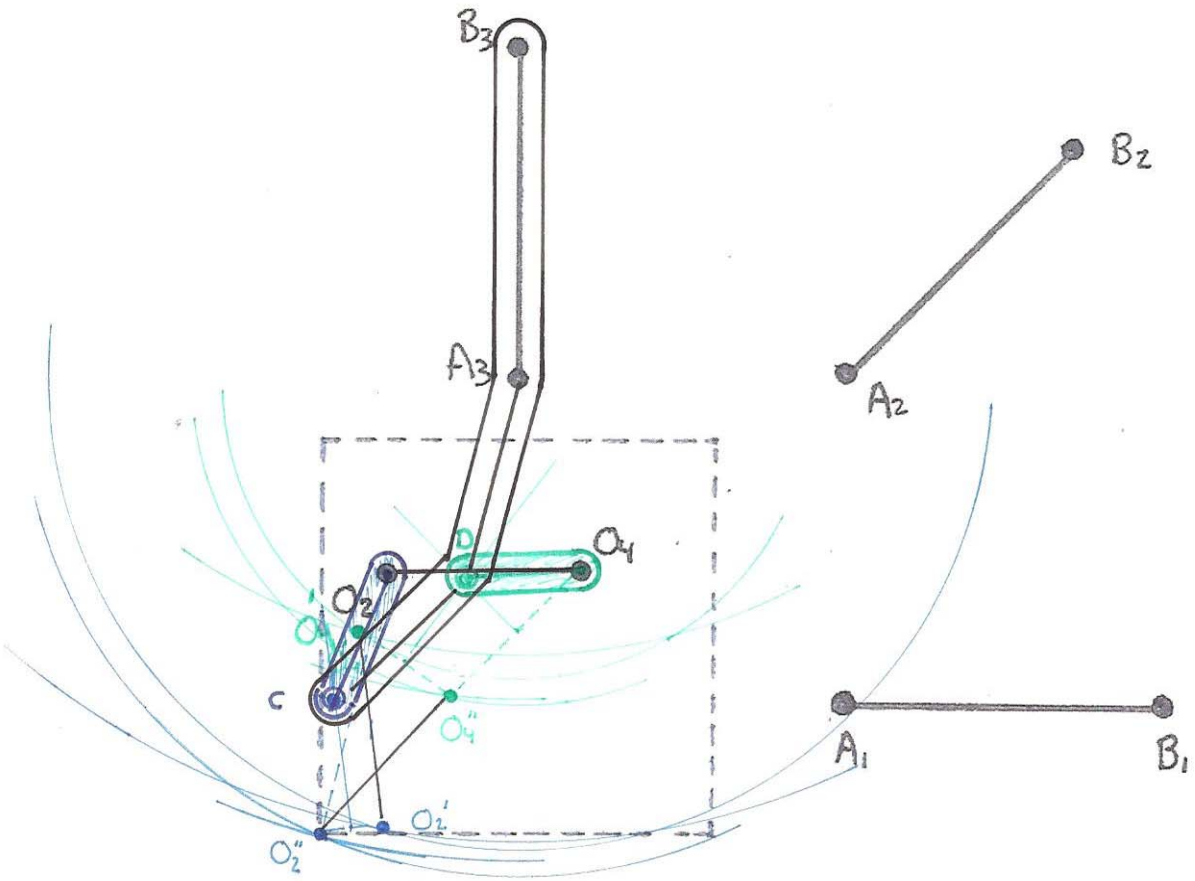


PROBLEM 3 (30 pts): Using the program that you created synthesize a drive linkage for the input link of a four bar mechanism that has the following extreme positions.

r_{O2x}= 6.674 ft, r_{O2y}=2 ft

r_{A1x}= 14.0 ft, r_{A1y}=2 ft

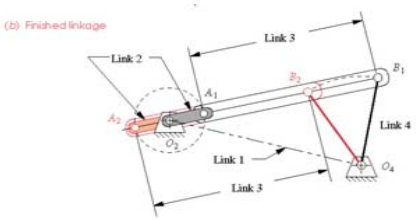
r_{A2x}= 4.5 ft, r_{A2y}=9 ft

Position the connection of the drive dyad half way up the input link.

NON-QUICK-RETURN (From Two-Position Approach A Results)

	X-pos	Y-pos	mag	angle	i	j
2P-O2 => O4	**6.67**	**2.00**	**6.97**	**16.7**	**0.9579**	**0.2871**
2P-A1	**14.00**	**2.00**	**14.14**	**8.1**	**0.9899**	**0.1414**
2P-A2	**4.50**	**9.00**	**10.06**	**63.4**	**0.4472**	**0.8944**

Factors		
P	0.5	**% dist up Link 4**
K	2.5	**Length of Link 3+Link 2 wrt B1B2**
Link 1	**12.00**	
Link 2	**2.95**	
Link 3	**11.80**	
Link 4	**3.66**	**Grashof**



$\dot{\theta}_2$ =	1.0470 1/s
$\ddot{\theta}_2$ =	0.0000 1/s^2
ω3-1	-0.2618 1/s
ω3-2	0.2618 1/s
ω4-1	0.0000 1/s
ω4-2	0.0000 1/s
α3-1	0.4649 1/s^2
α3-2	0.2792 1/s^2
α4-1	2.1524 1/s^2
α4-2	2.2225 1/s^2

					Normal (r)		Perpendicular (θ)	
	x comp	**y comp**	**mag**	**angle**	**i**	**j**	**i**	**j**
rO4	**6.67**	**2.00**	**6.97**	**16.7**	**0.9579**	**0.2871**	**-0.2871**	**0.9579**
rP2O2-A1	7.33	0.00	7.33	0.0	1.0000	0.0000	0.0000	1.0000
rP2O2-A2	-2.17	7.00	7.33	107.3	-0.2966	0.9550	-0.9550	-0.2966
rB1	**10.34**	**2.00**	**10.53**	**11.0**	**0.9818**	**0.1900**	**-0.1900**	**0.9818**
rO4B1	3.66	0.00	3.66	0.0	1.0000	0.0000	0.0000	1.0000
rB2	**5.59**	**5.50**	**7.84**	**44.6**	**0.7126**	**0.7015**	**-0.7015**	**0.7126**
rO4B2	-1.09	3.50	3.66	107.3	-0.2966	0.9550	-0.9550	-0.2966
rB1B2	-4.75	3.50	5.90	143.6	-0.8051	0.5932	-0.5932	-0.8051
rO2	**-1.54**	**10.75**	**10.86**	**98.1**	**-0.1416**	**0.9899**	**-0.9899**	**-0.1416**
rB102	-11.88	8.75	14.75	143.6	-0.8051	0.5932	-0.5932	-0.8051
rA1	**0.84**	**9.00**	**9.04**	**84.7**	**0.0926**	**0.9957**	**-0.9957**	**0.0926**
rO2A1	2.38	-1.75	2.95	-36.4	0.8051	-0.5932	0.5932	0.8051
rA2	**-3.91**	**12.50**	**13.10**	**107.4**	**-0.2987**	**0.9543**	**-0.9543**	**-0.2987**
rO2A2	-2.38	1.75	2.95	143.6	-0.8051	0.5932	-0.5932	-0.8051
rB1A1	-9.50	7.00	11.80	143.6	-0.8051	0.5932	-0.5932	-0.8051
rB2A2	-9.50	7.00	11.80	143.6	-0.8051	0.5932	-0.5932	-0.8051
rO4O2	-8.21	8.75	12.00	133.2	-0.6843	0.7292	-0.7292	-0.6843

Kinematics					Normal (r)		Perpendicular (θ)	
	x comp	**y comp**	**mag**	**angle**	**i**	**j**	**i**	**j**
r1	8.21	-8.75	12.00	-46.8	0.6843	-0.7292	0.7292	0.6843
r4-1	3.66	0.00	3.66	0.0	1.0000	0.0000	0.0000	1.0000
r4-2	-1.09	3.50	3.66	107.3	-0.2966	0.9550	-0.9550	-0.2966
r2-1	2.38	-1.75	2.95	-36.4	0.8051	-0.5932	0.5932	0.8051
r2-2	-2.38	1.75	2.95	143.6	-0.8051	0.5932	-0.5932	-0.8051
r3-1	9.50	-7.00	11.80	-36.4	0.8051	-0.5932	0.5932	0.8051
r3-2	9.50	-7.00	11.80	-36.4	0.8051	-0.5932	0.5932	0.8051
vA-1	1.83	2.49	3.09	53.6	0.5932	0.8051	-0.8051	0.5932
vA-2	-1.83	-2.49	3.09	-126.4	-0.5932	-0.8051	0.8051	-0.5932
vB-1	0.00	0.00	0.00	undefined	undefind	undefind	undefind	undefind
vB-2	0.00	0.00	0.00	undefined	undefind	undefind	undefind	undefind
aA-1	-2.60	1.92	3.23	143.6	-0.8051	0.5932	-0.5932	-0.8051
aA-2	2.60	-1.92	3.23	-36.4	0.8051	-0.5932	0.5932	0.8051
aB-1	0.00	7.88	7.88	90.0	0.0000	1.0000	-1.0000	0.0000
aB-2	-7.53	-2.34	7.89	-162.7	-0.9550	-0.2966	0.2966	-0.9550

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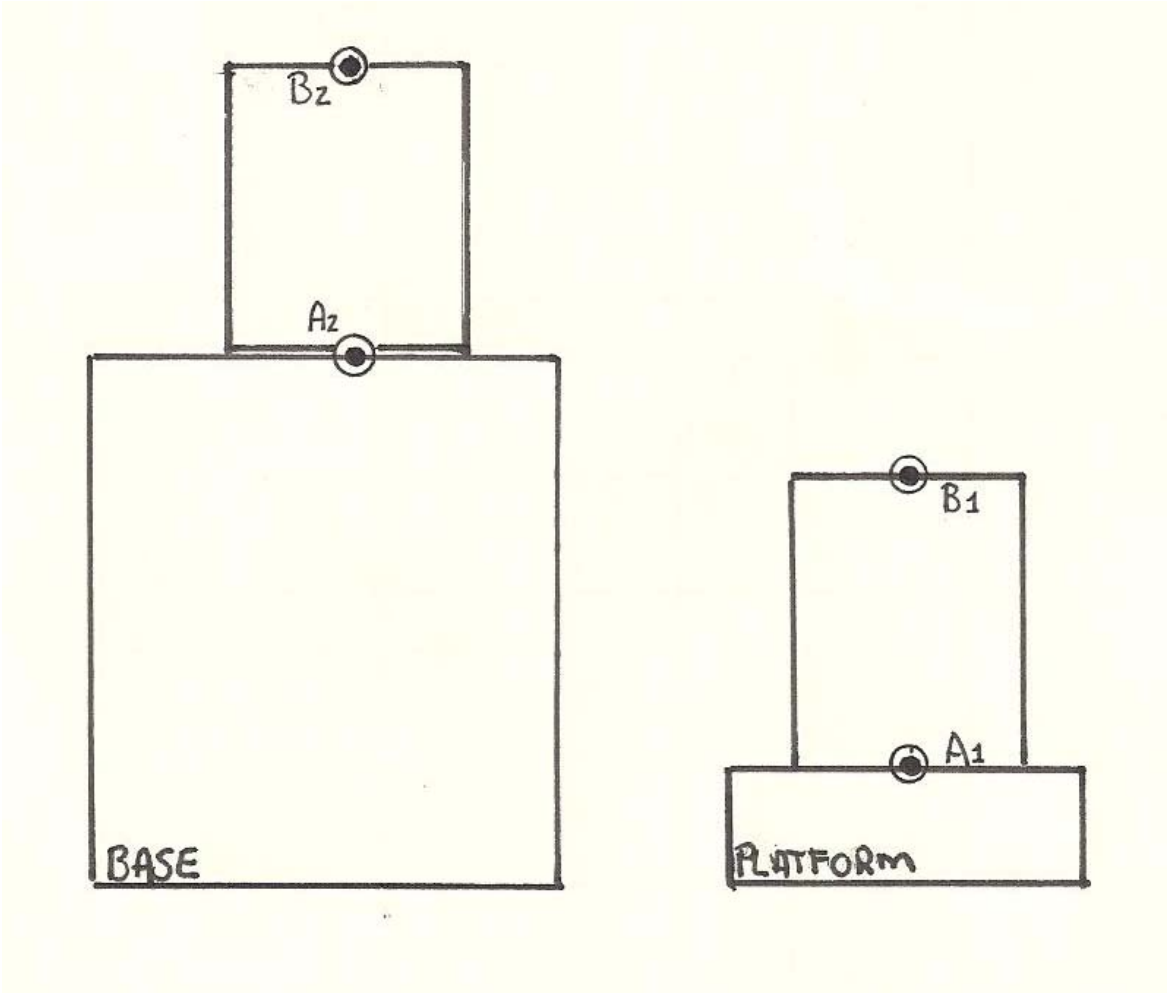

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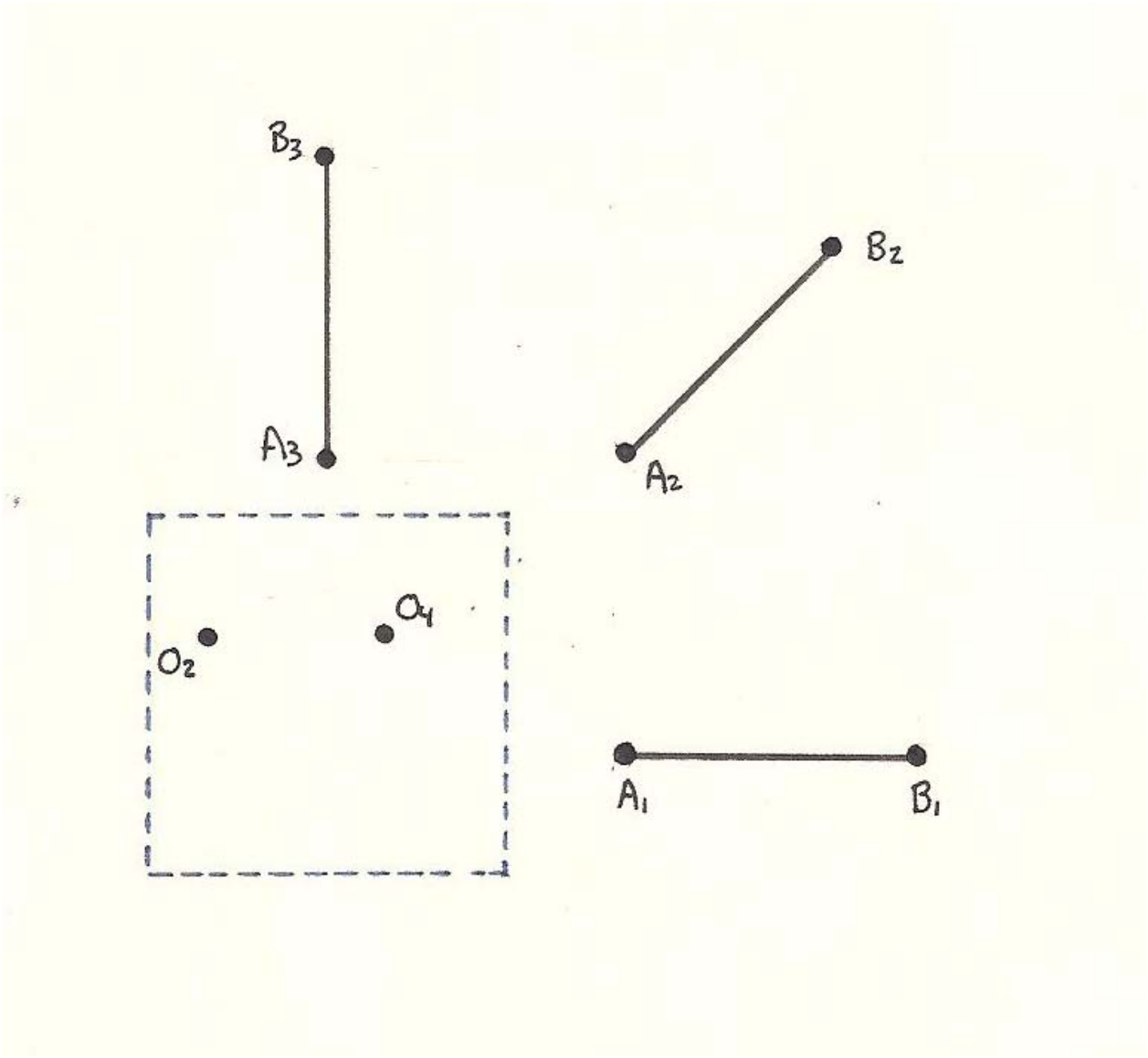

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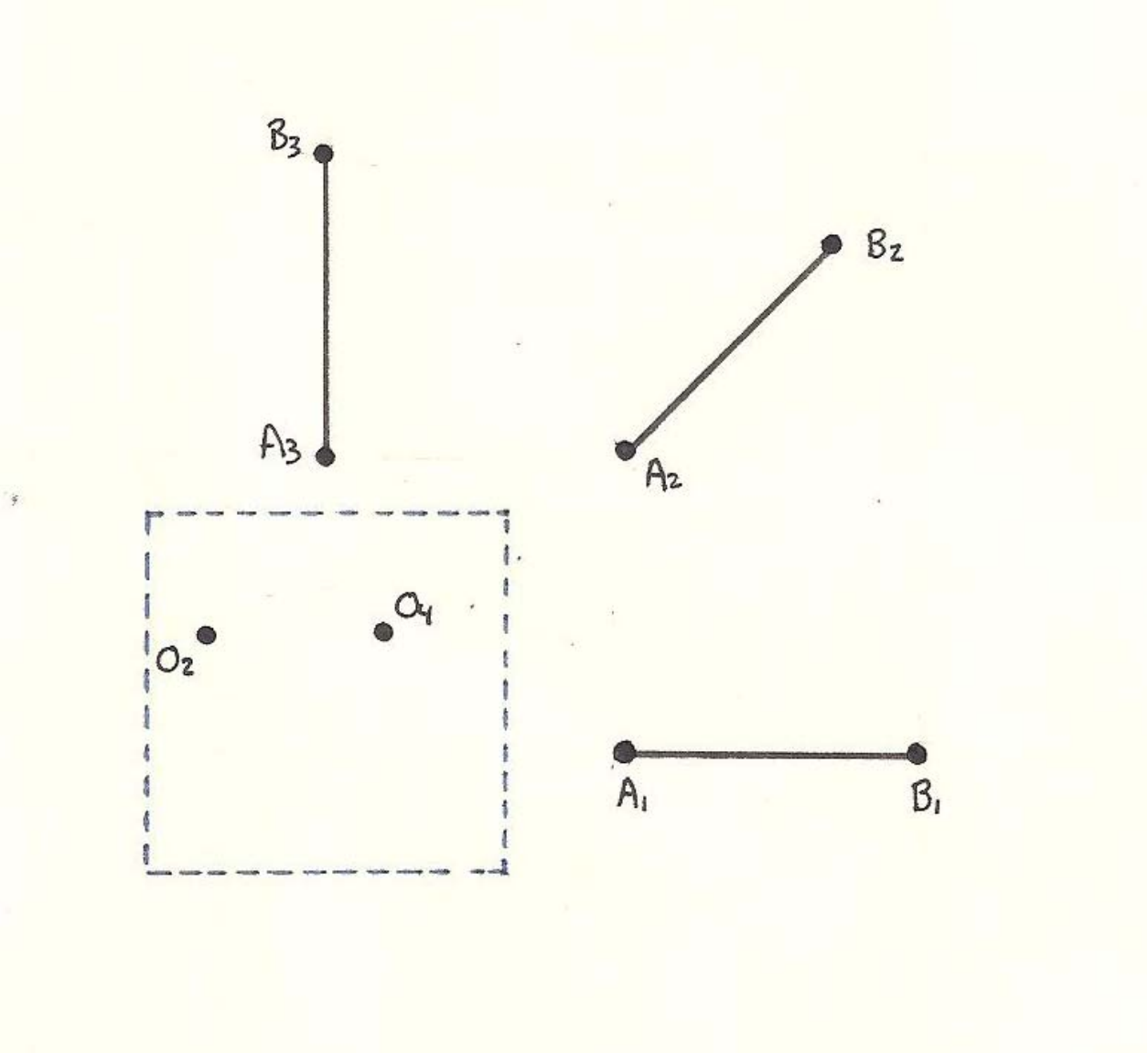

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