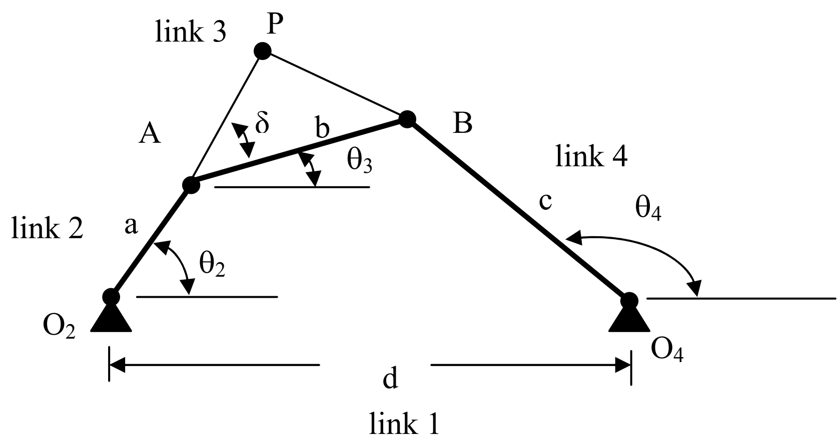
NAME:

PROBLEM 1: Given:

Link 1 = d = 9in	Link 2 = a = 7in	Link 3 = b = 11in	Link 4 = c = 6in
$\theta_2 = 120°$	$\omega_2 = 15$ 1/s	$\alpha_2 = -65$ 1/s^2	
$r_{pa} = 15$in	$\delta = 60°$		



Calculate:

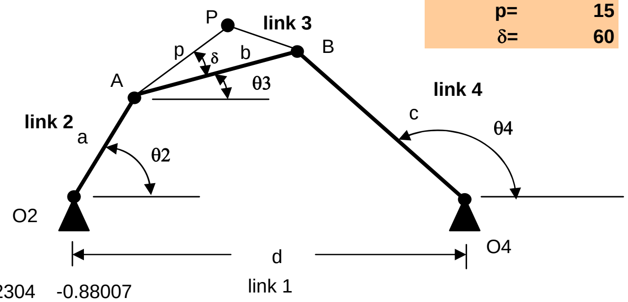
r_{Ax}= **-3.50 (-3.50)**	r_{Ay}= **6.06 (6.06)**	θ_3 = **-1.3 (-50.4)**	θ_4 = **104.5 (-156.3)**
r_{Bx}= **7.50 (3.51)**	r_{By}= **5.81 (-2.42)**	$\dot{\theta}_3$ = **2.65 (9.86)**	$\dot{\theta}_4$ = **15.54 (-3.03)**
r_{Px}= **4.30 (11.29)**	r_{Py}= **18.88 (8.56)**	$\ddot{\theta}_3$ = **-6.95 (-26.62)**	$\ddot{\theta}_4$ = **-127.3 (94.2)**
v_{Ax}= **-90.93 (-90.93)**	v_{Ay}= **-52.50 (-52.50)**	a_{Ax}= **1181. (1181)**	a_{Ay}= **-1136 (-1136)**
v_{Bx}= **-90.26 (-7.31)**	v_{By}= **-23.35 (16.62)**	a_{Bx}= **1102 (278)**	a_{By}= **-1211 (-495)**
v_{Px}= **-124.9 (-115.5)**	v_{py}= **-31.8 (93.4)**	a_{Px}= **1216 (-192)**	a_{py}= **-1281 (-1766)**

The crossed solution is in "()"

4-Bar Linkage

a=	**7**	Link 2		
b=	**11**	Link 3		
c=	**6**	Link 4		
d=	**9**	Link 1		
$\theta_2 =$	**120**	2.094395102		
$\dot{\theta}_2 =$	**15**	$1/s$		
$\ddot{\theta}_2 =$	**-65**	$1/s^2$		
By=	**5.81**	**-2.42**		
Bx=	**7.50**	**3.51**		
$\theta_3 =$	**-1.3**	**-50.4**	-0.02304	-0.88007
$\theta_4 =$	**104.5**	**-156.3**	1.823979	-2.72709
$\dot{\theta}_3 =$	**2.6504E+00**	**9.8626E+00**		
$\dot{\theta}_4 =$	**1.5539E+01**	**-3.0259E+00**		
$\ddot{\theta}_3 =$	**-6.9538E+00**	**-2.6177E+01**		
$\ddot{\theta}_4 =$	**-1.2733E+02**	**9.4202E+01**		

K1=	4.6800E+00
K2=	4.8497E-01
K3=	3.3923E+00
K4=	-1.4036E+01



p=	**15**
δ=	**60**

	x comp	y comp	mag	angle	i	j
r04=	**9.00**	**0.00**	**9.00**	**0.0**	**1.000**	**0.000**
rA=	**-3.50**	**6.06**	**7.00**	**120.0**	**-0.500**	**0.866**
rBA=	11.00	-0.25	11.00	-1.3	1.000	-0.023
rBO4=	-1.50	5.81	6.00	104.5	-0.250	0.968
rB=	**7.50**	**5.81**	**9.48**	**37.8**	**0.790**	**0.612**
rPA=	7.80	12.81	15.00	58.7	0.520	0.854
rP=	**4.30**	**18.88**	**19.36**	**77.2**	**0.222**	**0.975**
vA=	**-90.93**	**-52.50**	**105.00**	**-150.0**	**-0.866**	**-0.500**
vBA=	0.67	29.15	29.15	88.7	0.023	1.000
vB=	**-90.26**	**-23.35**	**93.23**	**-165.5**	**-0.968**	**-0.250**
vPA=	-33.96	20.67	39.76	148.7	-0.854	0.520
vP=	**-124.89**	**-31.83**	**128.89**	**-165.7**	**-0.969**	**-0.247**
aA=	**1181.54**	**-1136.49**	**1639.41**	**-43.9**	**0.721**	**-0.693**
aBA	-79.01	-74.69	108.73	-136.6	-0.727	-0.687
aB	**1102.53**	**-1211.18**	**1637.84**	**-47.7**	**0.673**	**-0.739**
aPA=	34.33	-144.23	148.26	-76.6	0.232	-0.973
aP=	**1215.88**	**-1280.72**	**1765.96**	**-46.5**	**0.689**	**-0.725**

ALT	x comp	y comp	mag	angle	i	j
rO4=	**9.00**	**0.00**	**9.00**	**0.0**	**1.000**	**0.000**
rA=	**-3.50**	**6.06**	**7.00**	**120.0**	**-0.500**	**0.866**
rBA=	7.01	-8.48	11.00	-50.4	0.637	-0.771
rBO4=	-5.49	-2.42	6.00	-156.3	-0.915	-0.403
rB=	**3.51**	**-2.42**	**4.26**	**-34.6**	**0.824**	**-0.567**
rPA=	14.79	2.50	15.00	9.6	0.986	0.166
rP=	**11.29**	**8.56**	**14.17**	**37.2**	**0.797**	**0.604**
vA=	**-90.93**	**-52.50**	**105.00**	**-150.0**	**-0.866**	**-0.500**
vBA=	83.62	69.12	108.49	39.6	0.771	0.637
vB=	**-7.31**	**16.62**	**18.16**	**113.7**	**-0.403**	**0.915**
vPA=	-24.61	145.88	147.94	99.6	-0.166	0.986
vP=	**-115.54**	**93.38**	**148.56**	**141.1**	**-0.778**	**0.629**
aA=	**1181.54**	**-1136.49**	**1639.41**	**-43.9**	**FALSE**	**-0.693**
aBA	-903.63	641.27	1108.04	144.6	-0.816	0.579
aB	**277.92**	**-495.22**	**567.88**	**-60.7**	**0.489**	**-0.872**
aPA=	-1373.41	-629.90	1510.97	-155.4	-0.909	-0.417
aP=	**-191.87**	**-1766.39**	**1776.78**	**-96.2**	**-0.108**	**-0.994**

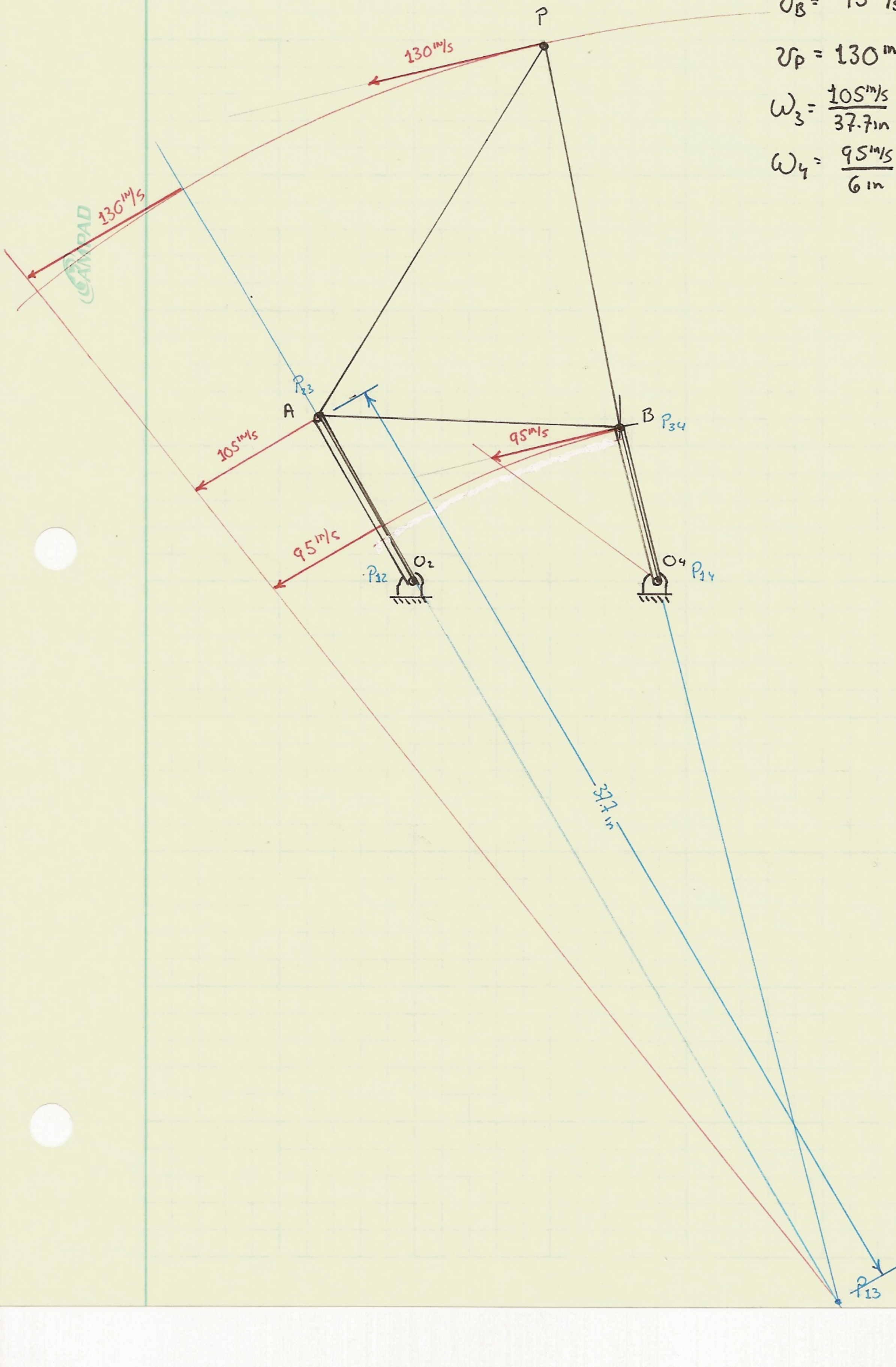
$v_A = 105\ \text{in/s}$

$v_B = 95\ \text{in/s}$

$v_P = 130\ \text{in/s}$

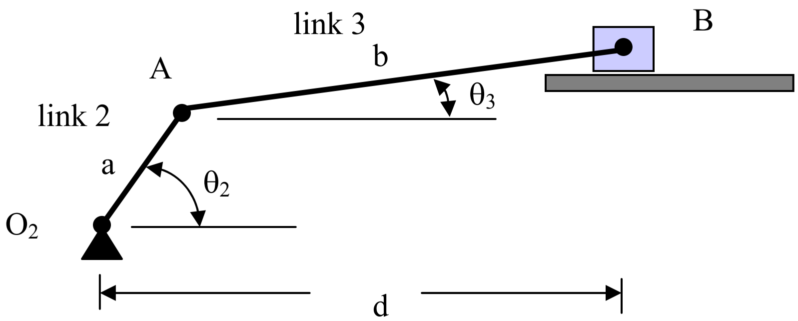
$$\omega_3 = \frac{105\ \text{in/s}}{37.7\ \text{in}} = 2.8\ \text{1/s}$$

$$\omega_4 = \frac{95\ \text{in/s}}{6\ \text{in}} = \underline{16}\ \text{1/s}$$



PROBLEM 2: Given:

Offset = 10in Link 2 = a = 7in Link 3 = b = 25in
θ_2 = 330° ω_2 = 100 1/s α_2 = 18 1/s^2



Calculate:

r_{Ax}= **6.06 (6.06)** r_{Ay}= **-3.50 (-3.50)** $\theta_3 =$ **32.7 (147.3)** $\ddot{\theta}_3 =$ **-1136 (1136)**

r_{Bx}= **27.10 (-14.98)** r_{By}= **10.00 (10.00)** $\dot{\theta}_3 =$ **-28.81 (28.81)**

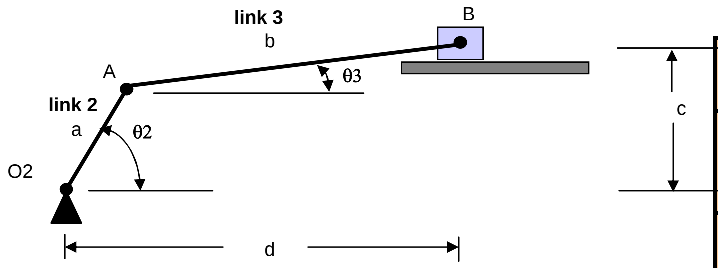
v_{Ax}= **350.0 (350.0)** v_{Ay}= **606.2 (606.2)** a_{Ax}= **-60560 (-60560)** a_{Ay}=**35110 (35110)**

v_{Bx}= **738.9 (-38.94)** v_{By}= **0 (0)** a_{Bx}= **62690 (-58430)** a_{By}= **0 (0)**

The crossed solution is in “()”

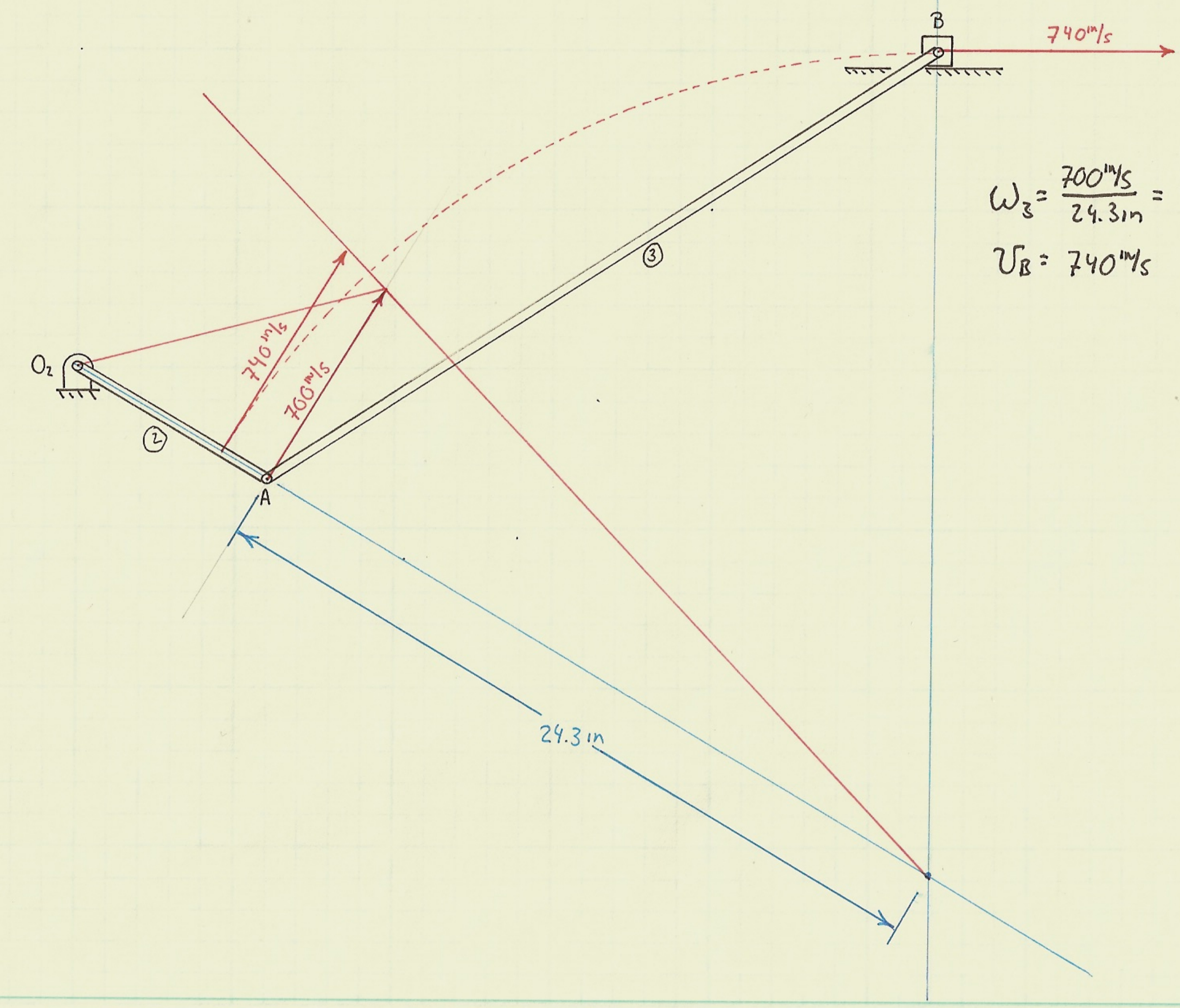
Slider Crank

a=	**7**	Link 2	
b=	**25**	Link 3	
c=	**10**	Link 1	
$\theta_2 =$	**330**	5.759586532	
$\dot{\theta}_2 =$	**100**	$1/s$	
$\ddot{\theta}_2 =$	**18**	$1/s^2$	
By=	**10.00**		**10.00**
Bx=	**27.10**		**-14.98**
$\theta_3 =$	**32.7**		**147.3**
$\dot{\theta}_3 =$	**-28.81**		**28.81**
$\ddot{\theta}_3 =$	**-1136.01**		**1136.01**
vB=	**738.94**		**-38.94**
aB=	**-77635.22**		**-43482.34**



	x comp	y comp	mag	angle	i	j
rB=	**27.10**	**10.00**	**28.89**	**20.3**	**0.938**	**0.346**
rA=	**6.06**	**-3.50**	**7.00**	**-30.0**	**0.866**	**-0.500**
rBA=	21.04	13.50	25.00	32.7	0.842	0.540
vB	**738.94**	**0.00**	**738.94**	**0.0**	**1.000**	**0.000**
vA	**350.00**	**606.22**	**700.00**	**60.0**	**0.500**	**0.866**
vBA	388.94	-606.22	720.26	-57.3	0.540	-0.842
aB	**-62687.97**	**0.00**	**62687.97**	**180.0**	**-1.000**	**0.000**
aA	**-60558.78**	**35109.12**	**70000.11**	**149.9**	**-0.865**	**0.502**
aBA	-2129.19	-35109.12	35173.62	-93.5	-0.061	-0.998

alt	x comp	y comp	mag	angle	i	j
rB=	**-14.98**	**10.00**	**18.01**	**146.3**	**-0.832**	**0.555**
rA=	**6.06**	**-3.50**	**7.00**	**-30.0**	**0.866**	**-0.500**
rBA=	-21.04	13.50	25.00	147.3	-0.842	0.540
vB	**-38.94**	**0.00**	**38.94**	**180.0**	**-1.000**	**0.000**
vA	**350.00**	**606.22**	**700.00**	**60.0**	**0.500**	**0.866**
vBA	-388.94	-606.22	720.26	-122.7	-0.540	-0.842
aB	**-58429.59**	**0.00**	**58429.59**	**180.0**	**-1.000**	**0.000**
aA	**-60558.78**	**35109.12**	**70000.11**	**149.9**	**-0.865**	**0.502**
aBA	2129.19	-35109.12	35173.62	-86.5	0.061	-0.998

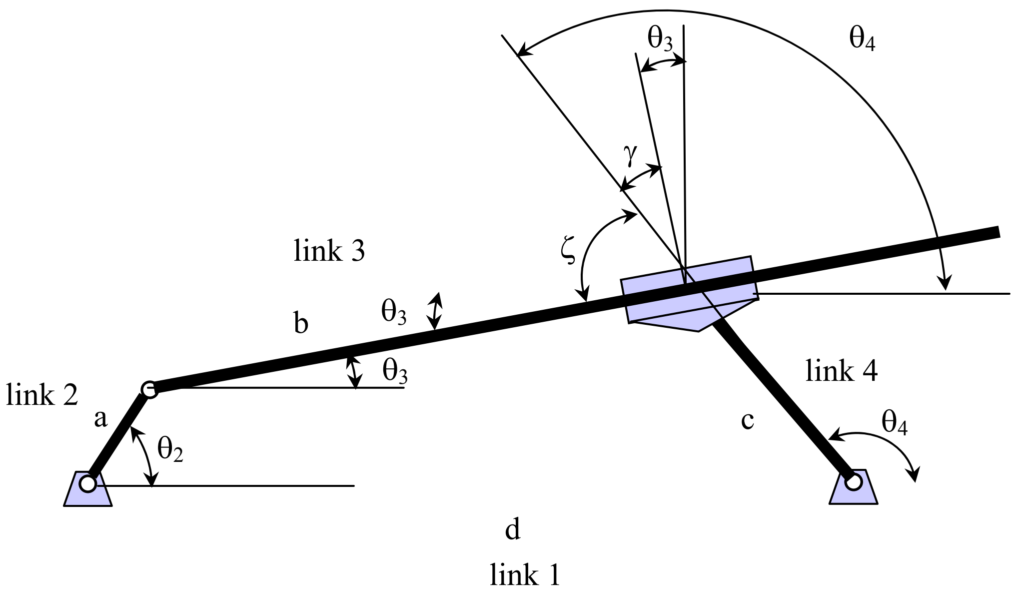


$$\omega_3 = \frac{700\ \text{in/s}}{24.3\ \text{in}} = 29\ \text{1/s}$$

$$v_B = 740\ \text{in/s}$$

PROBLEM 4: Given:

Link 1 = d = 3in	Link 2 = a = 10in	Link 4 = c = 6in
$\theta_2 = 45°$	$\omega_2 = 24$ 1/s	$\alpha_2 = 30$ 1/s^2
$\gamma = -45°$		



Calculate:

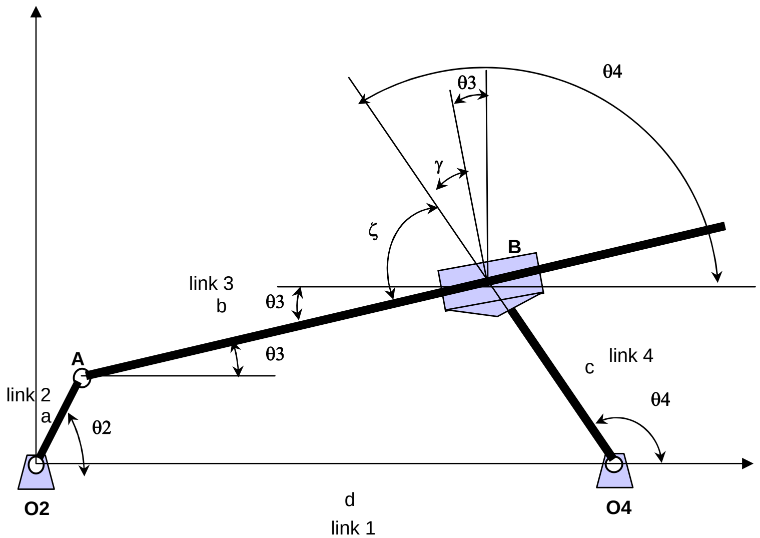
r_{Ax}= **7.07 (7.07)**	r_{Ay}= **7.07 (7.07)**	$\theta_3 =$ **-88.6 (28.7)**	$\theta_4 =$ **-43.6 (73.7)**
r_{Bx}=**7.35 (4.68)**	r_{By}= **-4.14 (5.76)**	$\dot{\theta}_3 =$ **23.75 (33.06)**	$\dot{\theta}_4 =$ **23.75 (33.06)**
$\dot{b} =$ **73.05 (-73.05)**	$\ddot{b} =$ **1079 (-1079)**	$\ddot{\theta}_3 =$ **-212.9 (-217.8)**	$\ddot{\theta}_4 =$ **-212.9 (-217.8)**
v_{Ax}= **-169.7 (-169.7)**	v_{Ay}= **169.7 (169.7)**	a_{Ax}= **-4285 (-4285)**	a_{Ay}= **-3861 (-3861)**
v_{Bx}= **98.26 (-190.4)**	v_{By}= **103.2 (55.54)**	a_{Bx}= **-3331 (-581.4)**	a_{By}= **1408 (-6661)**

The crossed solution is in “()”

Inverted Slider Crank

a=	10	Link 2	
c=	6	Link 4	
d=	3	Link 1	
$\theta_2 =$	45		
γ=	-45		
$\dot{\theta}_2 =$	24	$^1/_s$	
$\ddot{\theta}_2 =$	30	$^1/_{s^2}$	
b=	11.21		-2.73
$\theta_4 =$	-43.60		73.74
$\theta_3 =$	-88.60		28.74
$\dot{\theta}_4 =$	23.75		33.06
$\dot{\theta}_3 =$	23.75		33.06
b-dot=	73.05		-73.05
$\ddot{\theta}_4 =$	-212.93		-217.83
$\ddot{\theta}_3 =$	-212.93		-217.83
b-dotdot=	1078.84		-1078.84

ζ=	45
K1=	-2.12132034
K2=	-7.87867966
K3=	4.242640687



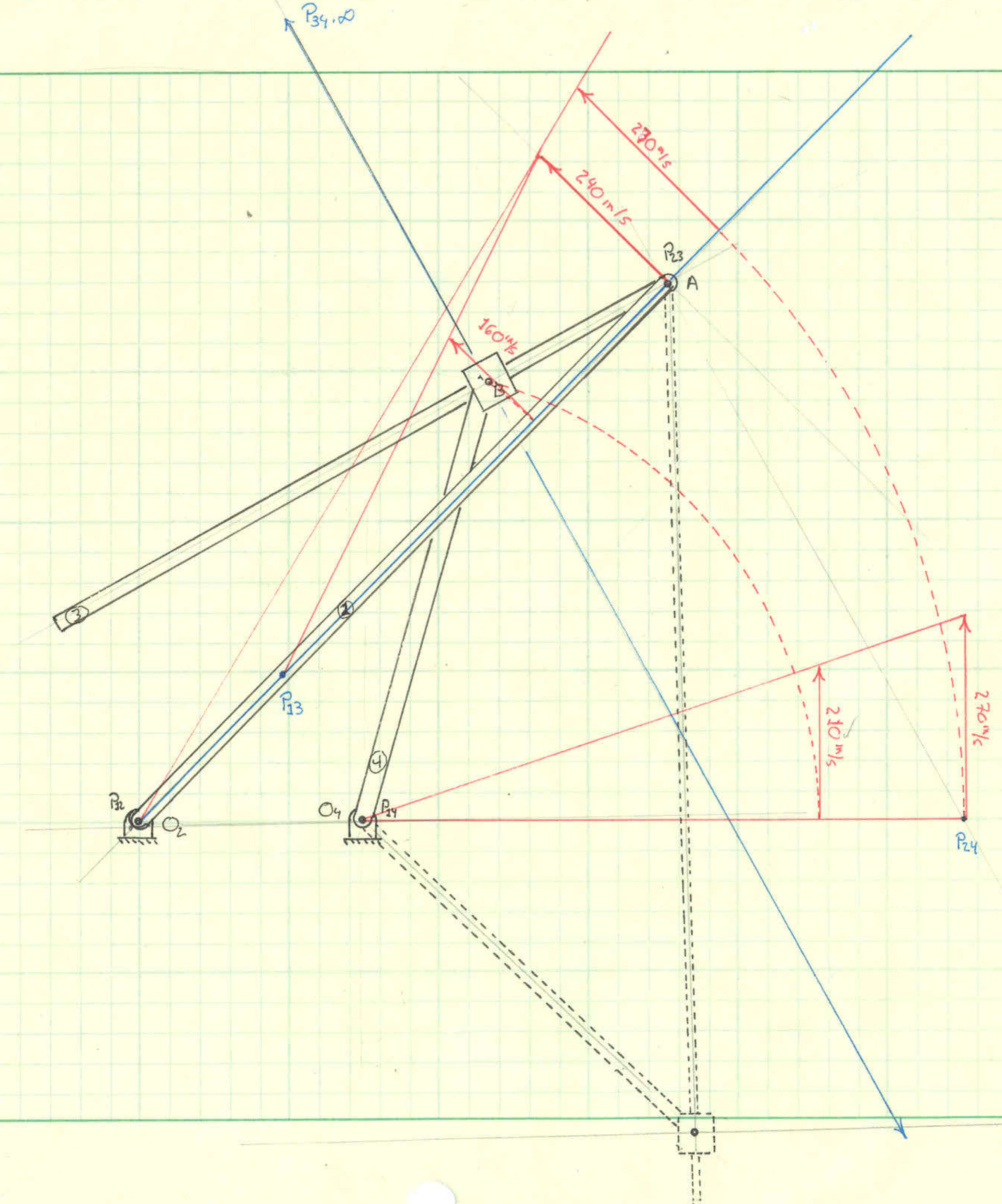
	x comp	y comp	mag	angle	i	j
rO4=	3.00	0.00	3.00	0.0	1.000	0.000
rA=	7.07	7.07	10.00	45.0	0.707	0.707
rBA=	0.27	-11.21	11.21	-88.6	0.024	-1.000
rBO4=	4.35	-4.14	6.00	-43.6	0.724	-0.690
rB=	7.35	-4.14	8.43	-29.4	0.871	-0.491
vA=	-169.71	169.71	240.00	135.0	-0.707	0.707
vBA=	267.97	-66.52	276.10	-13.9	0.971	-0.241
vB=	98.26	103.18	142.49	46.4	0.690	0.724
aA=	-4285.07	-3860.80	5767.81	-138.0	-0.743	-0.669
aBA=	953.67	5269.07	5354.68	79.7	0.178	0.984
aB=	-3331.40	1408.27	3616.83	157.1	-0.921	0.389

alt	x comp	y comp	mag	angle	i	j
rO4=	3.00	0.00	3.00	0.0	1.000	0.000
rA=	7.07	7.07	10.00	45.0	0.707	0.707
rBA=	-2.39	-1.31	2.73	-151.3	-0.877	-0.481
rB04=	1.68	5.76	6.00	73.7	0.280	0.960
rB=	4.68	5.76	7.42	50.9	0.631	0.776
vA=	-169.71	169.71	240.00	135.0	-0.707	0.707
vBA=	-20.71	-114.16	116.03	-100.3	-0.178	-0.984
vB=	-190.41	55.54	198.35	163.7	-0.960	0.280
aA=	-4285.07	-3860.80	5767.81	-138.0	-0.743	-0.669
aBA=	3703.63	-2799.93	4642.89	-37.1	0.798	-0.603
aB=	-581.44	-6660.74	6686.07	-95.0	-0.087	-0.996

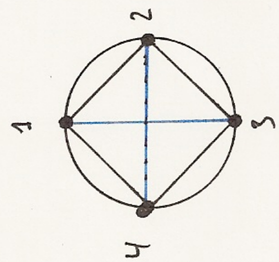
CROSSED SOLUTION

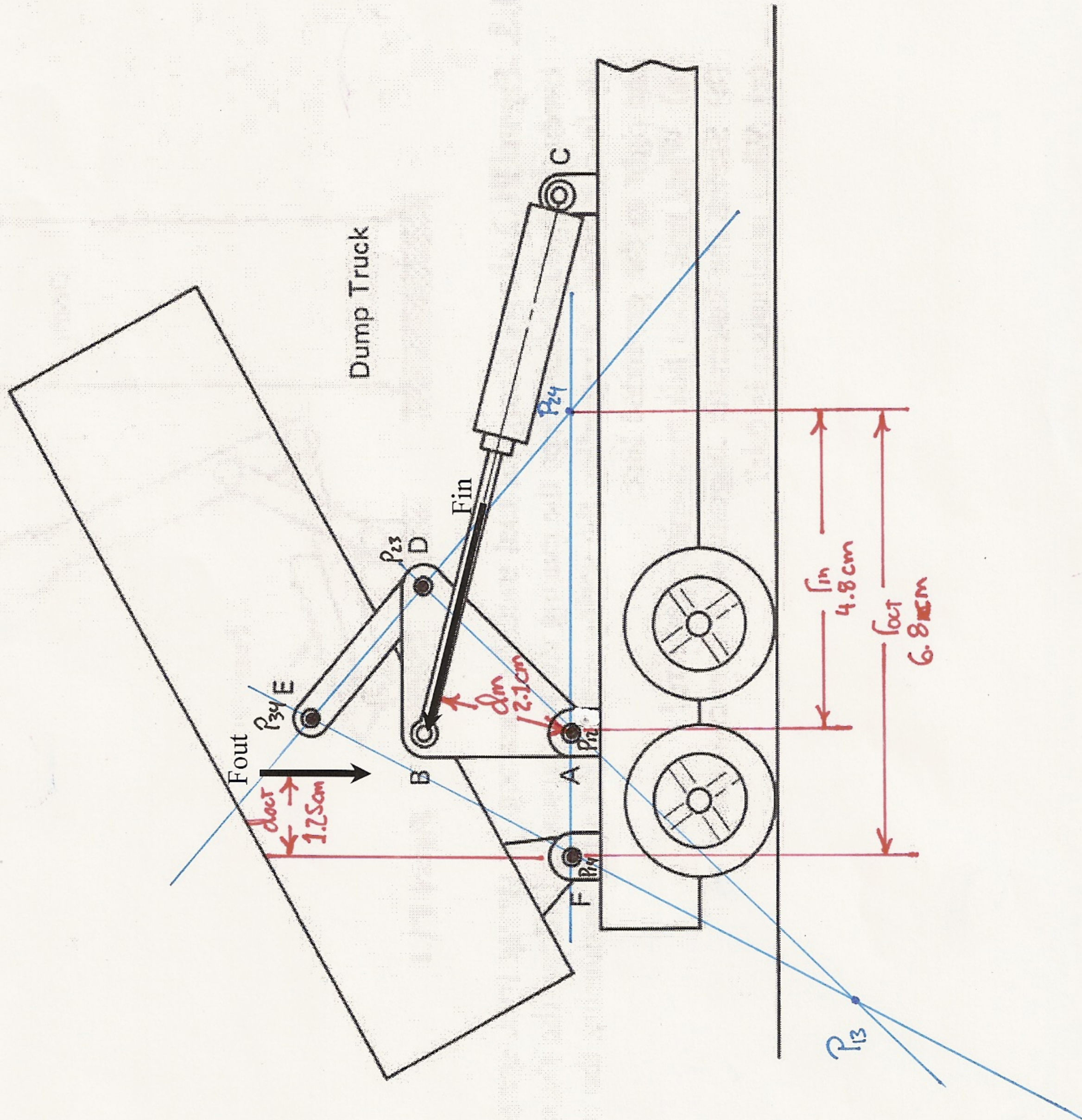
$$\omega_4 = \frac{270 \text{ in/s}}{8.05 \text{ in}} = 33 \text{ 1/s}$$

$$\omega_3 = \frac{240 \text{ in/s}}{7.3 \text{ in}} = 33 \text{ 1/s}$$



PROBLEM 4: Determine the mechanical advantage of the truck linkage shown.

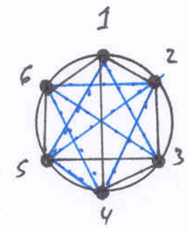




$$MA = \frac{d_{in}}{d_{out}} \cdot \frac{r_{out}}{r_{in}} = \frac{2.1\,cm}{1.25\,cm} \cdot \frac{6.8\,cm}{4.8\,cm} = \boxed{2.4}$$

PROBLEM 5: Given: the length of link 2 in 1 inch and it is rotating ccw at 10 1/s

Find: ω_3, ω_5, ω_6, v_c

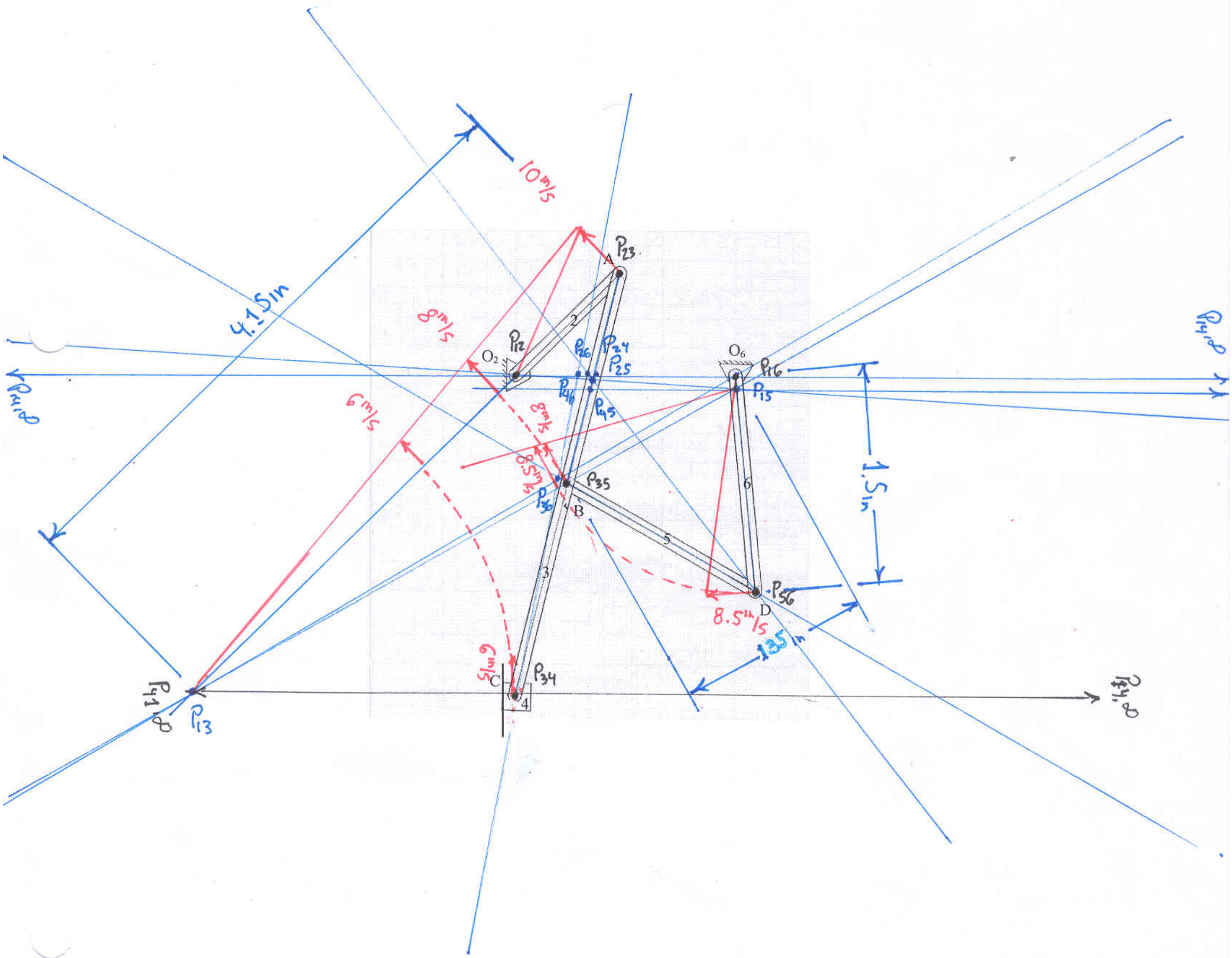


$\omega_3 = \dfrac{10\,in/s}{4.15in} = \boxed{2.4\,1/s}$

$v_c = \boxed{6\,in/s}$

$\omega_5 = \dfrac{8\,in/s}{1.35in} = \boxed{5.9\,1/s}$

$\omega_6 = \dfrac{8.5\,in/s}{1.5in} = \boxed{5.7\,1/s}$



1.3

PROBLEM 6: Two segment cam.

Segment 1: Constant velocity of 10in/s for 0.5s.
Follower position starts at 0in.

Segment 2: Return the follower to the initial conditions. FOR 0.5s

SEGMENT 1 $0 \leq \theta \leq \pi$

THE BOUNDARY CONDITIONS ARE

$S(0) = 0$

$v(0) = 10^{in}/s \quad v(\pi) = 10^{in}/s$

$a(0) = 0^{in}/s^2$

THE APPROPRIATE POLYNOMIAL FOR THE CONSTANT VELOCITY CONSTRAINT

$S(\theta) = C_0 + C_1 \cdot \left(\frac{\theta}{\pi}\right)$

$S(0) = 0 = C_0 \Rightarrow \quad S(\theta) = C_1\left(\frac{\theta}{\pi}\right)$

THE VELOCITY MUST BE CONVERTED FROM in/s TO in/RAD

$\omega = 1 \frac{REV}{s} \cdot \frac{2\pi \text{ RAD}}{REV} = 6.283 \text{ RAD}/s$

$v = 10\frac{in}{s} \cdot \frac{1}{6.283 \text{ RAD}/s} = 1.592 \text{ in/RAD}$

$v(\theta) = \frac{C_1}{\pi}$

$v(0) = 1.592 \text{ in/RAD} = \frac{C_1}{\pi}$

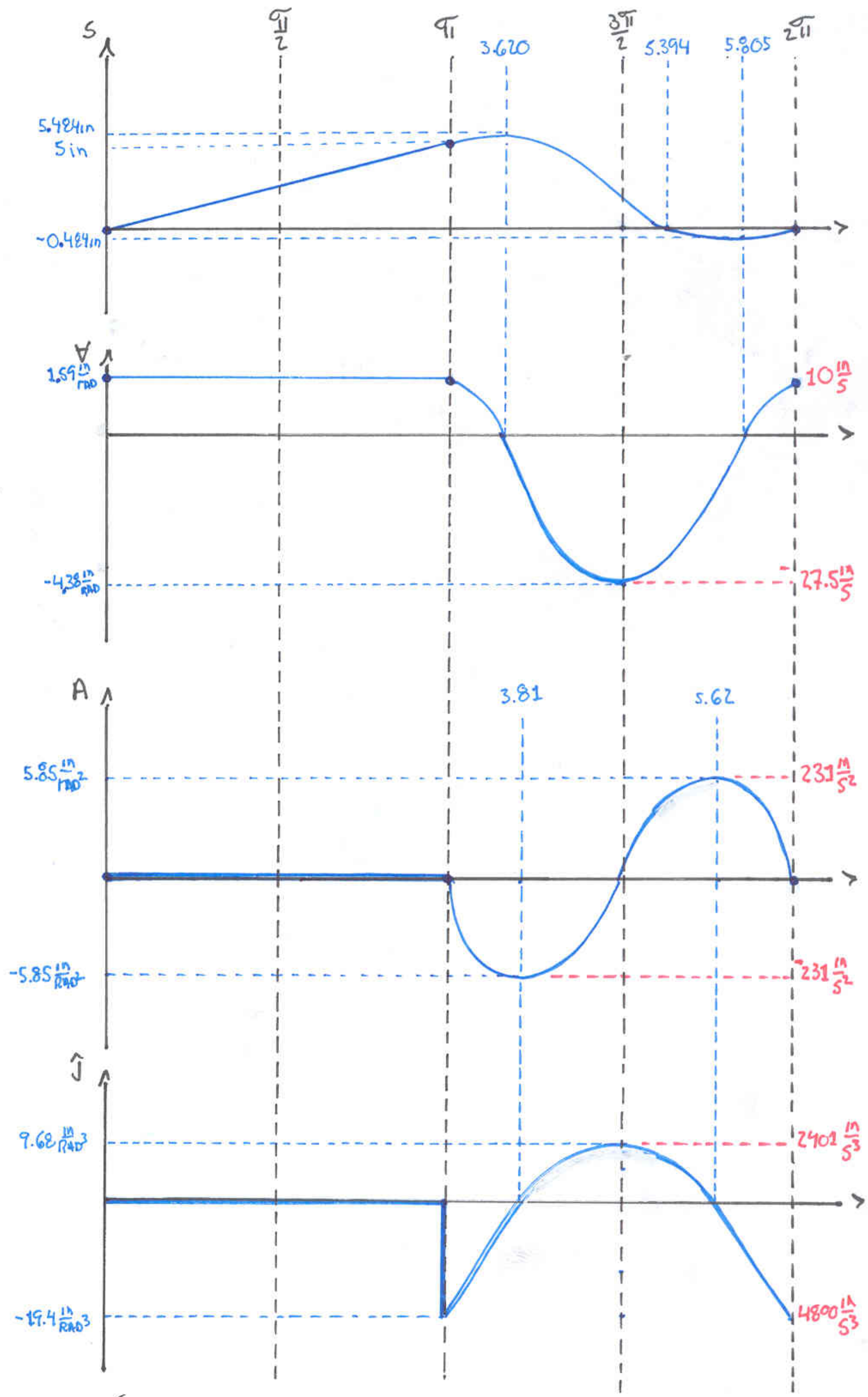
$\Rightarrow C_1 = 5.00 \text{ in}$

$$\boxed{\begin{aligned} S(\theta) &= 5.00\text{in}\left(\frac{\theta}{\pi}\right) \\ v(\theta) &= \frac{5.00\text{in}}{\pi \text{ RAD}} = 1.592 \text{ in/RAD} \\ a(\theta) &= 0 \\ J(\theta) &= 0 \end{aligned}}$$

$S(0) = 0\text{in}$

$S(\pi) = 5.00\text{in}$

$v(0) = v(\pi) = 1.592 \text{ in/RAD}$



SEGMENT 2

$\pi \leq \theta \leq 2\pi \Rightarrow \theta^* = \theta - \pi \Rightarrow 0 \leq \theta^* \leq \pi \; , \; \beta = \pi$

FOR THE SEGMENT THERE ARE SIX BOUNDARY CONDITIONS THAT MUST BE SATISFIED

$S(0) = 5\,in \qquad v(0) = 1.591\ in/rad \qquad a(0) = 0\ in/rad^2$
$S(\pi) = 0\,in \qquad v(\pi) = 1.591\ in/rad \qquad a(\pi) = 0\ in/rad^2$

THE APPROPRIATE POLYNOMIAL OF SIX BOUNDARY CONDITIONS IS

$$S = C_0 + C_1\left(\frac{\theta^*}{\pi}\right) + C_2\left(\frac{\theta^*}{\pi}\right)^2 + C_3\left(\frac{\theta^*}{\pi}\right)^3 + C_4\left(\frac{\theta^*}{\pi}\right)^4 + C_5\left(\frac{\theta^*}{\pi}\right)^5$$

$$S_0 = \underline{5\,in = C_0} \Rightarrow S(\theta^*) = 5\,in + C_1\left(\frac{\theta^*}{\pi}\right) + C_2\left(\frac{\theta^*}{\pi}\right)^2 + C_3\left(\frac{\theta^*}{\pi}\right)^3 + C_4\left(\frac{\theta^*}{\pi}\right)^4 + C_5\cdot\left(\frac{\theta^*}{\pi}\right)^5$$

$$v(\theta^*) = \frac{C_1}{\pi} + \frac{2\cdot C_2}{\pi^2}\cdot\theta^* + \frac{3\cdot C_3}{\pi^3}\cdot\theta^{*2} + \frac{4\cdot C_4}{\pi^4}\cdot\theta^{*3} + \frac{5\cdot C_5}{\pi^5}\cdot\theta^{*4}$$

$$\underline{v(0)} = 1.591\ in/rad = \frac{C_1}{\pi} \Rightarrow C_1 = 5.00\ in$$

$$S(\theta^*) = 5\,in + 5.\,in\left(\frac{\theta^*}{\pi}\right) + C_2\left(\frac{\theta^*}{\pi}\right)^2 + C_3\cdot\left(\frac{\theta^*}{\pi}\right)^3 + C_4\left(\frac{\theta^*}{\pi}\right)^4 + C_5\cdot\left(\frac{\theta^*}{\pi}\right)^5$$

$$v(\theta^*) = \frac{5\,in}{\pi} + \frac{2\cdot C_2}{\pi^2}\cdot\theta^* + \frac{3\cdot C_3}{\pi^3}\cdot\theta^{*2} + \frac{4\cdot C_4}{\pi^4}\cdot\theta^{*3} + \frac{5\cdot C_5}{\pi^5}\cdot\theta^{*4}$$

$$a(\theta^*) = \frac{2\cdot C_2}{\pi^2} + \frac{6\cdot C_3}{\pi^3}\cdot\theta^* + \frac{12\cdot C_4}{\pi^4}\cdot\theta^{*2} + \frac{20\cdot C_5}{\pi^5}\cdot\theta^{*3}$$

$$\underline{a(0)} = 0\ \frac{in}{rad^2} = \frac{2\cdot C_2}{\pi^2} \Rightarrow C_2 = 0$$

$$S(\theta^*) = 5\,in + 5\,in\left(\frac{\theta^*}{\pi}\right) + C_3\left(\frac{\theta^*}{\pi}\right)^3 + C_4\left(\frac{\theta^*}{\pi}\right)^4 + C_5\left(\frac{\theta^*}{\pi}\right)^5$$

$$v(\theta^*) = \frac{5\,in}{\pi} + \frac{3\cdot C_3}{\pi^3}\cdot\theta^{*2} + \frac{4\cdot C_4}{\pi^4}\cdot\theta^{*3} + \frac{5\cdot C_5}{\pi^5}\cdot\theta^{*4}$$

$$a(\theta^*) = \frac{6\cdot C_3}{\pi^3}\cdot\theta^* + \frac{12\cdot C_4}{\pi^4}\cdot\theta^{*2} + \frac{20\cdot C_5}{\pi^5}\cdot\theta^{*3}$$

THREE MORE BOUNDARY CONDITIONS EXIST AT THE END OF THE SEGMENT THAT CAN NOW BE APPLIED

$$S(\pi) = 0\,in = 5\,in + 5\,in + C_3 + C_4 + C_5 \Rightarrow \underline{-10\,in = C_3 + C_4 + C_5}$$

$$v(\pi) = 1.591\ in/rad = \frac{5\,in}{\pi\,rad} + \frac{3\cdot C_3}{\pi^3\,rad^3}\cdot\pi^2\,rad^2 + \frac{4\cdot C_4}{\pi^4\,rad^4}\cdot\pi^3\,rad^3 + \frac{5\cdot C_5}{\pi^5\,rad^5}\cdot\pi^4\,rad^4$$

$$\Rightarrow \underline{0 = 3\cdot C_3 + 4\cdot C_4 + 5\cdot C_5}$$

$$a(\pi) = 0\ in/rad^2 = \frac{6\cdot C_3}{\pi^2\,rad^2} + \frac{12\cdot C_4}{\pi^2\,rad^2} + \frac{20\cdot C_5}{\pi^2\,rad^2} \Rightarrow \underline{0 = 6\cdot C_3 + 12\cdot C_4 + 20\,C_5}$$

$$\begin{bmatrix} 1 & 1 & 1 \\ 3 & 4 & 5 \\ 6 & 12 & 20 \end{bmatrix} \begin{Bmatrix} C_3 \\ C_4 \\ C_5 \end{Bmatrix} = \begin{Bmatrix} -10\,in \\ 0 \\ 0 \end{Bmatrix} \Rightarrow \begin{Bmatrix} C_3 \\ C_4 \\ C_5 \end{Bmatrix} = \begin{Bmatrix} -100 \\ 150 \\ -60 \end{Bmatrix} [IN]$$

THE EQUATIONS FOR SEGMENT 2 CAN NOW BE WRITTEN

$$s(\theta^*) = 5\,in + 1.592\tfrac{in}{rad}\cdot\theta^* - 3.225\tfrac{in}{rad^3}\cdot\theta^{*3} + 1.540\tfrac{in}{rad^4}\cdot\theta^{*4} - 0.1961\tfrac{in}{rad^5}\cdot\theta^{*5}$$

$$v(\theta^*) = 1.592\tfrac{in}{rad} - 9.6755\tfrac{in}{rad^3}\cdot\theta^{*2} + 6.160\tfrac{in}{rad^4}\cdot\theta^{*3} - 0.9803\,\theta^{*4}$$

$$a(\theta^*) = -19.351\tfrac{in}{rad^3}\cdot\theta^* + 18.48\tfrac{in}{rad^4}\cdot\theta^{*2} - 3.921\tfrac{in}{rad^5}\cdot\theta^{*3}$$

$$j(\theta^*) = 36.96\tfrac{in}{rad^4}\cdot\theta^* - 11.76\tfrac{in}{rad^5}\cdot\theta^{*2} - 19.351\tfrac{in}{rad^3}$$

DETERMINING THE ROOTS OF THE ABOVE EQUATIONS SO THAT MAX AND MIN'S CAN BE COMPUTED (ONLY THE REAL ROOTS ARE SHOWN AND ONLY THE ROOTS IN THE INTERVAL)

FOR DISPLACEMENT : 2.252 , 3.1416(π)

FOR VELOCITY : 0.4784 , 2.6632

FOR ACCELERATION : 0.0 , 1.5708, 3.1416 (π)

FOR JERK : 0.6639 , 2.4777

FOR THE DERIVATIVE OF THE JERK : 1.5708

NOW VALUES FOR EACH OF THE FUNCTIONS CAN BE FOUND AT CRITICAL POINTS

$s(0) = 5.000\,in$ $\quad s(0.4784) = 5.484\,in$ $\quad s(2.6632) = -0.4840\,in$ $\quad s(\pi) = 0.000\,in$

$v(0) = 1.592\tfrac{in}{rad}$ $\quad v(\tfrac{\pi}{2}) = -4.377\tfrac{in}{rad}$ $\quad v(\pi) = 1.592\tfrac{in}{rad}$

$a(0) = 0$ $\quad a(0.6639) = -5.850\,in/rad^2$ $\quad a(2.4777) = 5.850\,in/rad^2$ $\quad a(\pi) = 0$

$j(0) = -19.35$ $\quad j(\tfrac{\pi}{2}) = 9.68$ $\quad j(\pi) = -19.35$