

8.5.1

$$r = 3 \sec \theta$$

$$r = \frac{3}{\cos \theta}$$

$$r \cdot \cos \theta = 3$$

$$x = 3$$

Loddrett linje gjennom $x=3$

8.5.2

$$r = -2 \csc \theta$$

$$r = -\frac{2}{\sin \theta}$$

$$r \cdot \sin \theta = -2$$

$$y = -2$$

Horisontal linje gjennom $y=-2$

8.5.3

$$r = \frac{5}{3 \sin \theta - 4 \cos \theta}$$

$$3r \sin \theta - 4r \cos \theta = 5$$

$$3y - 4x = 5$$

$$3y = 4x + 5$$

$$y = \frac{4}{3}x + \frac{5}{3}$$

Ret linje med stigningstall

$\frac{4}{3}$ og konstantledd $\frac{5}{3}$

8.5.4

$$r = \sin \theta + \cos \theta$$

$$r^2 = r \sin \theta + r \cos \theta$$

$$x^2 + y^2 = y + x$$

$$x^2 - x + y^2 - y = 0$$

$$\left(x + \frac{-1}{2}\right)^2 - \frac{(-1)^2}{4} + \left(y + \frac{-1}{2}\right)^2 - \frac{(-1)^2}{4} = 0$$

$$\left(x - \frac{1}{2}\right)^2 + \left(y - \frac{1}{2}\right)^2 = \left(\frac{\sqrt{1}}{2}\right)^2$$

Sirkel med senter i $(\frac{1}{2}, \frac{1}{2})$ og radius $\sqrt{\frac{1}{2}}$.

(8.5.5)

$$r^2 = \csc 2\theta$$

$$r^2 = \frac{1}{\sin 2\theta} = \frac{1}{2 \sin \theta \cdot \cos \theta}$$

$$r \cdot \sin \theta \cdot r \cdot \cos \theta = \frac{1}{2}$$

$$x \cdot y = \frac{1}{2}$$

$$y = \frac{1}{2x}$$

Hyperbel

8.5.6

$$r = \sec \theta \cdot \tan \theta$$

$$r = \frac{1}{\cos \theta} \cdot \frac{\sin \theta}{\cos \theta}$$

$$r^2 \cdot \cos^2 \theta = r \cdot \sin \theta$$

$$x^2 = y$$

parabel

8.5.7

$$r = \sec \theta (1 + \tan \theta)$$

$$r = \frac{1}{\cos \theta} \left(1 + \frac{\sin \theta}{\cos \theta} \right)$$

$$r \cos \theta = 1 + \frac{\sin \theta}{\cos \theta}$$

$$r \cos^2 \theta = \cos \theta + \sin \theta$$

$$r^2 \cos^2 \theta = r \cos \theta + r \sin \theta$$

$$x^2 = x + y$$

$$y = x^2 - x$$

parabel

8.5.8

$$r = \frac{2}{\sqrt{\cos^2 \theta + 4 \sin^2 \theta}}$$

$$r^2 \cos^2 \theta + 4r^2 \sin^2 \theta = 4$$

$$x^2 + 4y^2 = 4$$

$$\frac{x^2}{2^2} + \frac{y^2}{1^2} = 1$$

Ellipse

8.5.9

$$r = \frac{1}{1 - \cos \theta}$$

$$r - r \cos \theta = 1$$

$$r - x = 1$$

$$r = x + 1$$

$$r^2 = (x + 1)^2$$

$$x^2 + y^2 = (x + 1)^2$$

$$x^2 + y^2 = x^2 + 2x + 1$$

$$y^2 = 2x + 1$$

$$x = \frac{1}{2}y^2 - \frac{1}{2}$$

parabel

8.5.10

$$r = \frac{2}{2 - \cos \theta}$$

$$2r - r \cos \theta = 2$$

$$2r - x = 2$$

$$2r = x + 2$$

$$4r^2 = (x + 2)^2$$

$$4(x^2 + y^2) = x^2 + 4x + 4$$

$$4x^2 - x^2 + -4x + 4y^2 - 4 = 0$$

$$3x^2 - 4x + 4y^2 - 4 = 0$$

$$3\left(x + \frac{-4}{2 \cdot 3}\right)^2 - \frac{(-4)^2}{4 \cdot 3} + 4y^2 - 4 = 0$$

$$3\left(x - \frac{2}{3}\right)^2 + 4y^2 = \frac{16}{3}$$

$$\frac{\left(x - \frac{2}{3}\right)^2}{\left(\frac{4}{3}\right)^2} + \frac{y^2}{\left(\frac{2}{\sqrt{3}}\right)^2} = 1$$

Ellipse

8.5.11

$$r = \frac{2}{1-2\sin\theta}$$

$$r - 2r\sin\theta = 2$$

$$r - 2y = 2$$

$$r = 2 + 2y = 2(y+1)$$

$$r^2 = 4(y+1)^2$$

$$x^2 + y^2 = 4(y^2 + 2y + 1)$$

$$x^2 + y^2 - 4y^2 - 8y - 4 = 0$$

$$x^2 - 3y^2 - 8y - 4 = 0$$

$$x^2 - 3\left(y + \frac{-8}{2 \cdot (-3)}\right)^2 - \frac{(-8)^2}{4 \cdot (-3)} - 4 = 0$$

$$x^2 - 3\left(y + \frac{4}{3}\right)^2 = -\frac{4}{3}$$

$$\frac{\left(y + \frac{4}{3}\right)^2}{\left(\frac{2}{3}\right)^2} - \frac{x^2}{\left(\frac{2}{\sqrt{3}}\right)^2} = 1$$

Hyperbel

8.5.12

$$r = \frac{2}{1+\sin\theta}$$

$$r + r\sin\theta = 2$$

$$r^2 = (2-y)^2$$

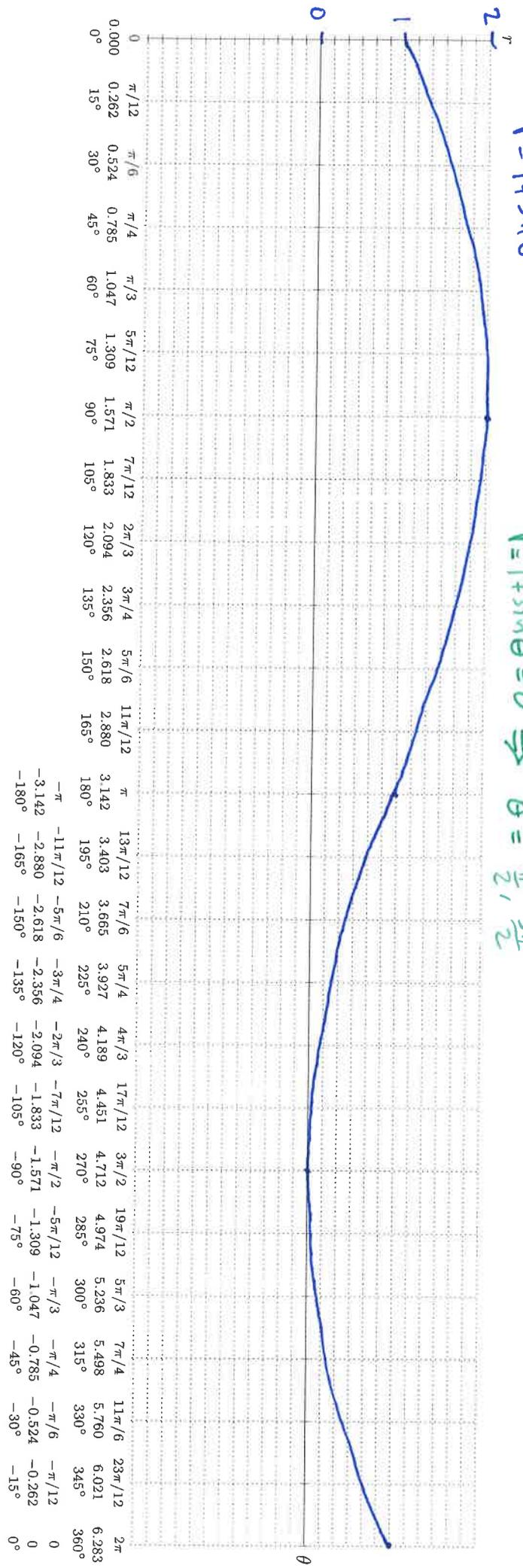
$$x^2 + y^2 = 4 - 4y + y^2$$

$$x^2 = 4 - 4y$$

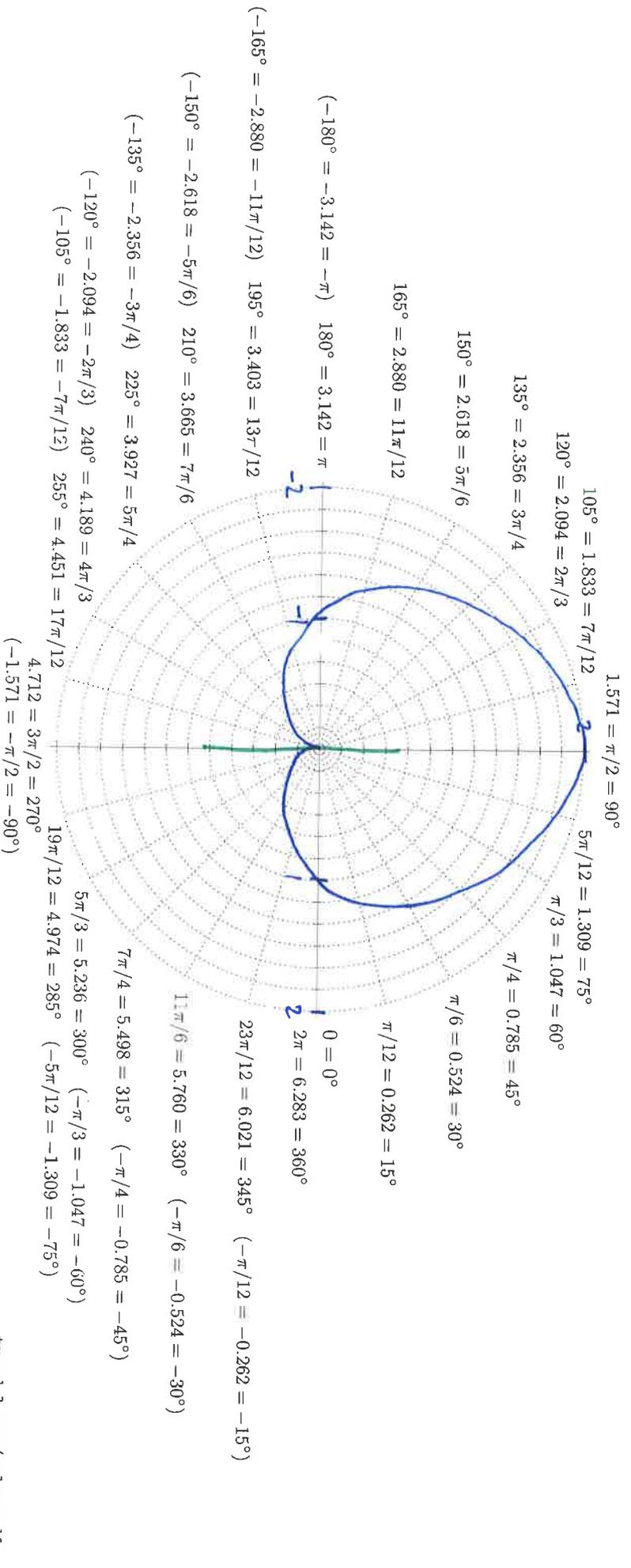
parabel

$$r = 1 + \sin \theta$$

$$r = 1 + \sin \theta = 0 \Rightarrow \theta = \frac{\pi}{2}, \frac{3\pi}{2}$$



8.5.13

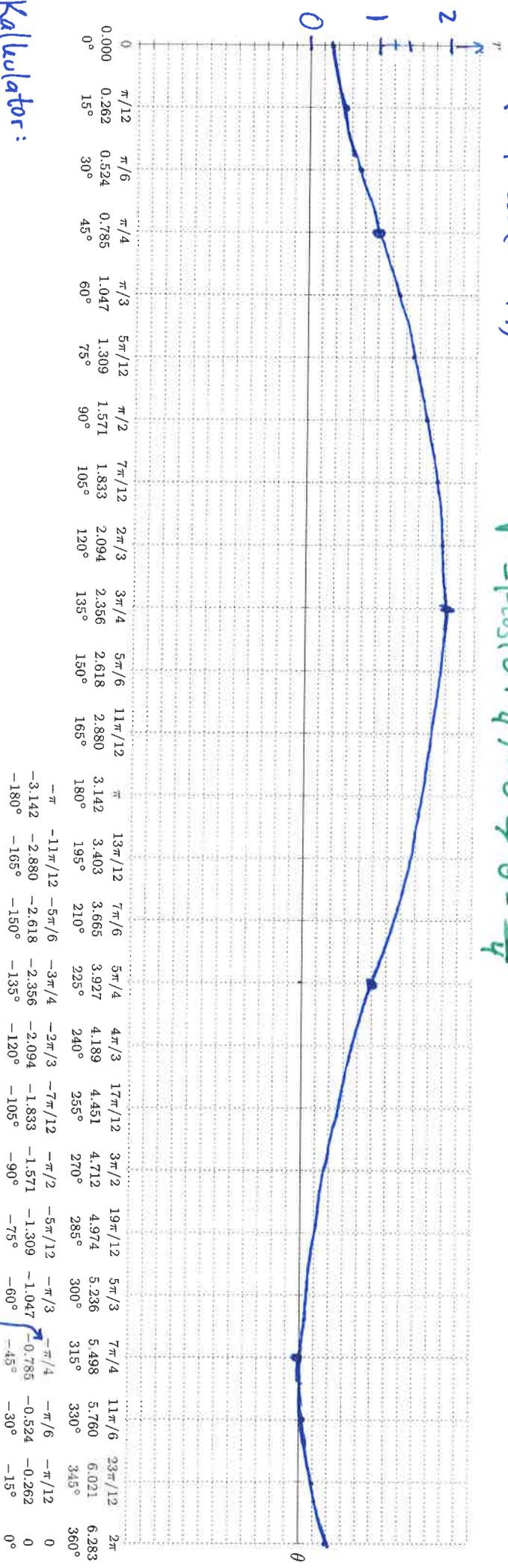


0	0.000	0.262	0.524	0.785	1.047	1.309	1.571	1.833	2.094	2.356	2.618	2.880	3.142	3.403	3.665	3.927	4.189	4.451	4.712	4.974	5.236	5.498	5.760	6.021	6.283
0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°	195°	210°	225°	240°	255°	270°	285°	300°	315°	330°	345°	360°	
-π	-11π/12	-5π/6	-3π/4	-2π/3	-7π/12	-π/2	-5π/12	-π/3	-2π/3	-7π/12	-π/2	-5π/12	-π/3	-2π/3	-7π/12	-π/2	-5π/12	-π/3	-2π/3	-7π/12	-π/2	-5π/12	-π/3	-2π/3	-7π/12
-3.142	-2.880	-2.618	-2.356	-2.094	-1.833	-1.571	-1.309	-1.047	-0.785	-0.524	-0.262	0	0.262	0.524	0.785	1.047	1.309	1.571	1.833	2.094	2.356	2.618	2.880	3.142	

- 150° = 2.618 = 5π/6
- 135° = 2.356 = 3π/4
- 120° = 2.094 = 2π/3
- 105° = 1.833 = 7π/12
- 90° = 1.571 = π/2
- 75° = 1.309 = 5π/12
- 60° = 1.047 = π/3
- 45° = 0.785 = π/4
- 30° = 0.524 = π/6
- 15° = 0.262 = π/12
- 0 = 0°
- 2π = 6.283 = 360°
- 23π/12 = 6.021 = 345° (-π/12 = -0.262 = -15°)
- 11π/6 = 5.760 = 330° (-π/6 = -0.524 = -30°)
- 7π/4 = 5.498 = 315° (-π/4 = -0.785 = -45°)
- 5π/3 = 5.236 = 300° (-π/3 = -1.047 = -60°)
- 4.712 = 4.974 = 285° (-5π/12 = -1.309 = -75°)
- 4.271 = 3π/2 = 270°
- 3.712 = 3π/2 = 270°
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- 0.712 = 3π/2 = 270°
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- 283.676 = -2π
- 284.219 = -2π
- 284.762 = -2π
- 285.305 = -2π
- 285.848 = -2π
- 286.391 = -2π
- 286.934 = -2π
- 287.477 = -2π
- 288.020 = -2π
- 288.563 = -2π
- 289.106 = -2π
- 289.649 = -2π
- 290.192 = -2π
- 290.735 = -2π
- 291.278 = -2π
- 291.821 = -2π
- 292.364 = -2π
- 292.907 = -2π
- 293.450 = -2π
- 293.993 = -2π
- 294.536 = -2π
- 295.079 = -2π
- 295.622 = -2π
- 296.165 = -2π
- 296.708 = -2π
- 297.251 = -2π
- 297.794 = -2π
- 298.337 = -2π
- 298.880 = -2π
- 299.423 = -2π
- 299.966 = -2π
- 300.509 = -2π
- 301.052 = -2π
- 301.595 = -2π
- 302.138 = -2π
- 302.681 = -2π
- 303.224 = -2π
- 303.767 = -2π
- 304.310 = -2π
- 304.853 = -2π
- 305.396 = -2π
- 305.939 = -2π
- 306.482 = -2π
- 307.025 = -2π
- 307.568 = -2π
- 308.111 = -2π
- 308.654 = -2π
- 309.197 = -2π
- 309.740 = -2π
- 310.283 = -2π
- 310.826 = -2π
- 311.369 = -2π
- 311.912 = -2π
- 312.455 = -2π
- 313.000 = -2π
- 313.543 = -2π
- 314.086 = -2π
- 314.629 = -2π
- 315.172 = -2π
- 315.715 = -2π
- 316.258 = -2π
- 316.801 = -2π
- 317.344 = -2π
- 317.887 = -2π
- 318.430 = -2π
- 318.973 = -2π
- 319.516 = -2π
- 320.059 = -2π
- 320.602 = -2π
- 321.145 = -2π
- 321.688 = -2π
- 322.231 = -2π
- 322.774 = -2π
- 323.317 = -2π
- 323.860 = -2π
- 324.403 = -2π
- 324.946 = -2π
- 325.489 = -2π
- 326.032 = -2π
- 326.575 = -2π
- 327.118 = -2π
- 32

$$r = 1 - \cos(\theta + \pi/4)$$

$$r = 1 - \cos(\theta + \pi/4) = 0 \Rightarrow \theta = \frac{7\pi}{4}$$



Kalkulator:

Lager tabell med

steglengde $\frac{\pi}{12} = 0.261799$

$105^\circ = 1.833 = 7\pi/12$

$120^\circ = 2.094 = 2\pi/3$

$135^\circ = 2.356 = 3\pi/4$

$150^\circ = 2.618 = 5\pi/6$

$165^\circ = 2.880 = 11\pi/12$

$(-180^\circ = -3.142 = -\pi)$

$(-165^\circ = -2.880 = -11\pi/12)$

$(-150^\circ = -2.618 = -5\pi/6)$

$(-135^\circ = -2.356 = -3\pi/4)$

$(-120^\circ = -2.094 = -2\pi/3)$

$(-105^\circ = -1.833 = -7\pi/12)$

$(-90^\circ = -1.571 = -\pi/2)$

$-\pi = -3.142$

$-180^\circ = -3.142$

$-165^\circ = -2.880$

$-150^\circ = -2.618$

$-135^\circ = -2.356$

$-120^\circ = -2.094$

$-105^\circ = -1.833$

$-90^\circ = -1.571$

$-75^\circ = -1.309$

$-60^\circ = -1.047$

$-45^\circ = -0.785$

$-30^\circ = -0.524$

$-15^\circ = -0.262$

$0^\circ = 0$

$15^\circ = 0.262$

$30^\circ = 0.524$

$45^\circ = 0.785$

$60^\circ = 1.047$

$75^\circ = 1.309$

$90^\circ = 1.571$

$105^\circ = 1.833$

$120^\circ = 2.094$

$135^\circ = 2.356$

$150^\circ = 2.618$

$165^\circ = 2.880$

$180^\circ = 3.142$

$195^\circ = 3.403$

$210^\circ = 3.665$

$225^\circ = 3.927$

$240^\circ = 4.189$

$255^\circ = 4.451$

$270^\circ = 4.712$

$285^\circ = 4.974$

$300^\circ = 5.236$

$315^\circ = 5.498$

$330^\circ = 5.760$

$345^\circ = 6.021$

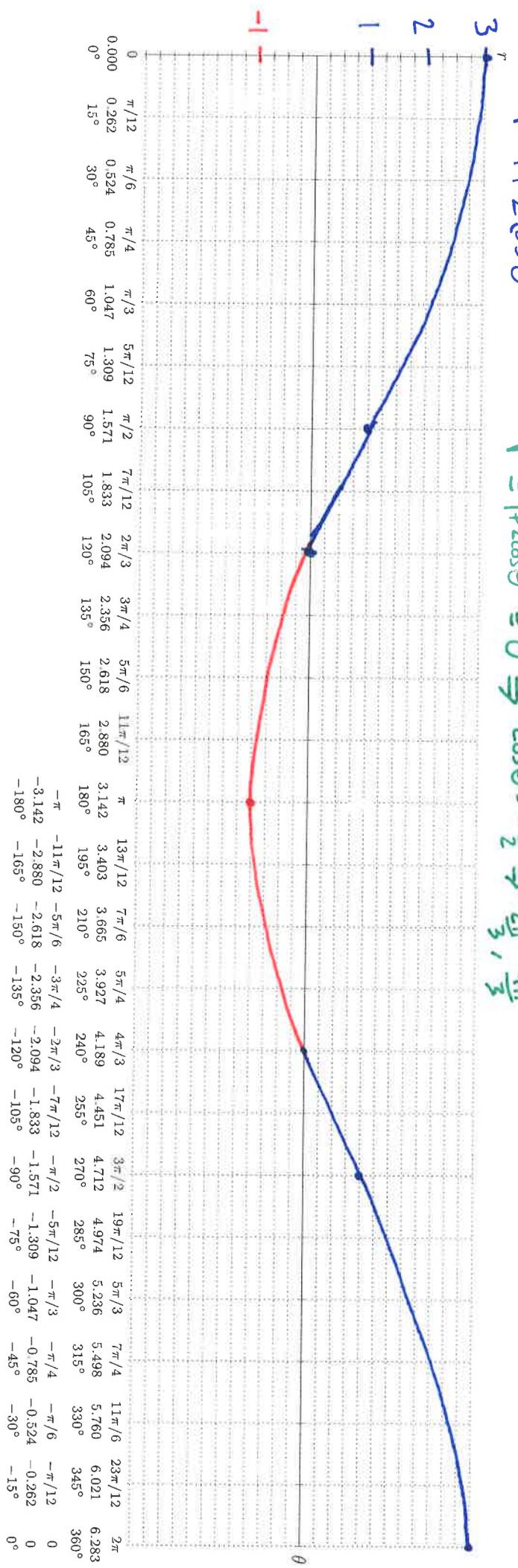
$360^\circ = 6.283$

$\cos(\theta + \pi/4) = 1$ nær $\theta = -\frac{7\pi}{4}$

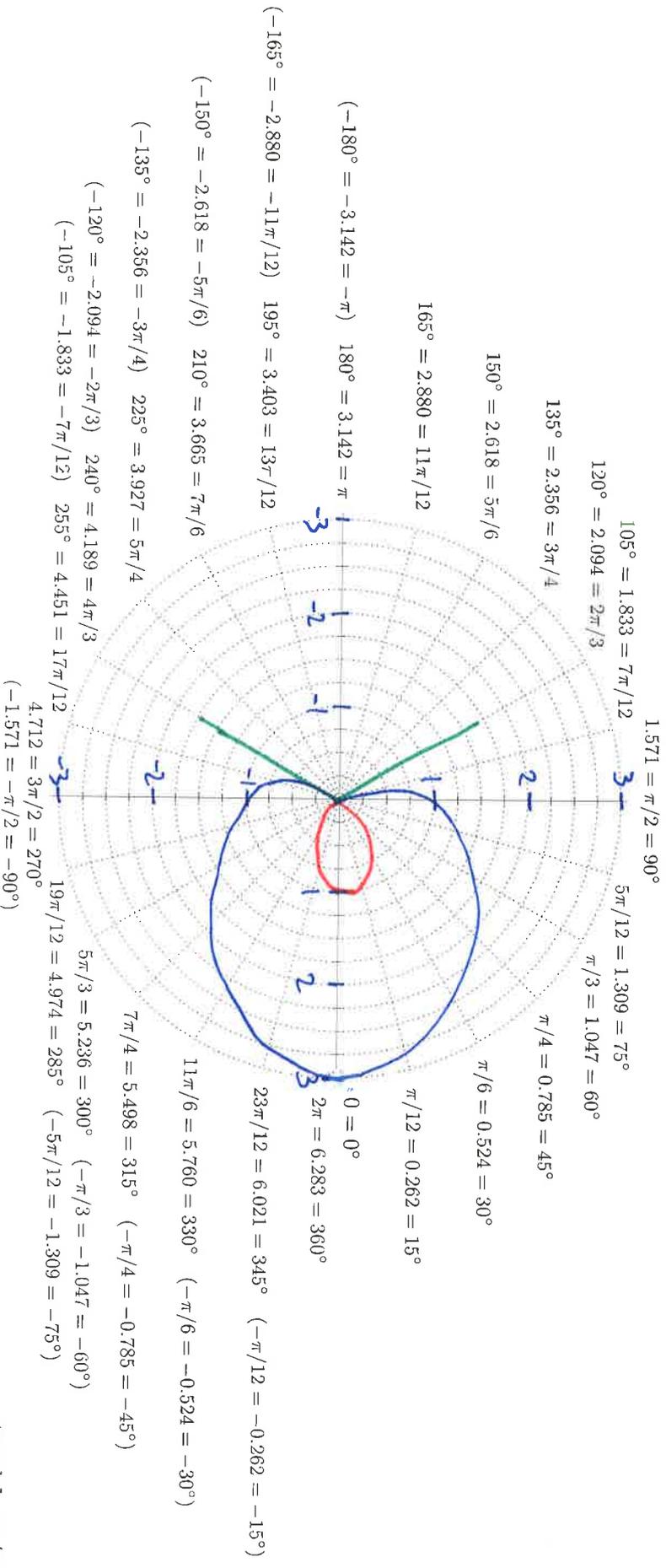
8.5.14

$$r = 1 + 2\cos\theta$$

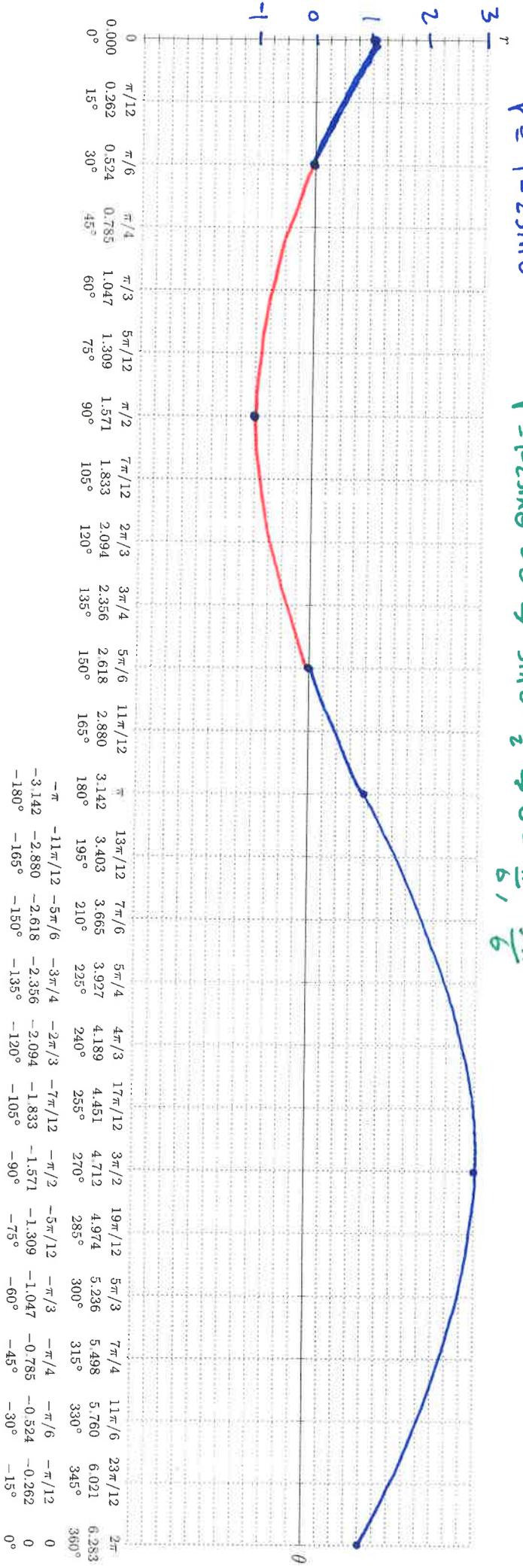
$$r = 1 + 2\cos\theta = 0 \Rightarrow \cos\theta = -\frac{1}{2} \Rightarrow \frac{2\pi}{3}, \frac{4\pi}{3}$$



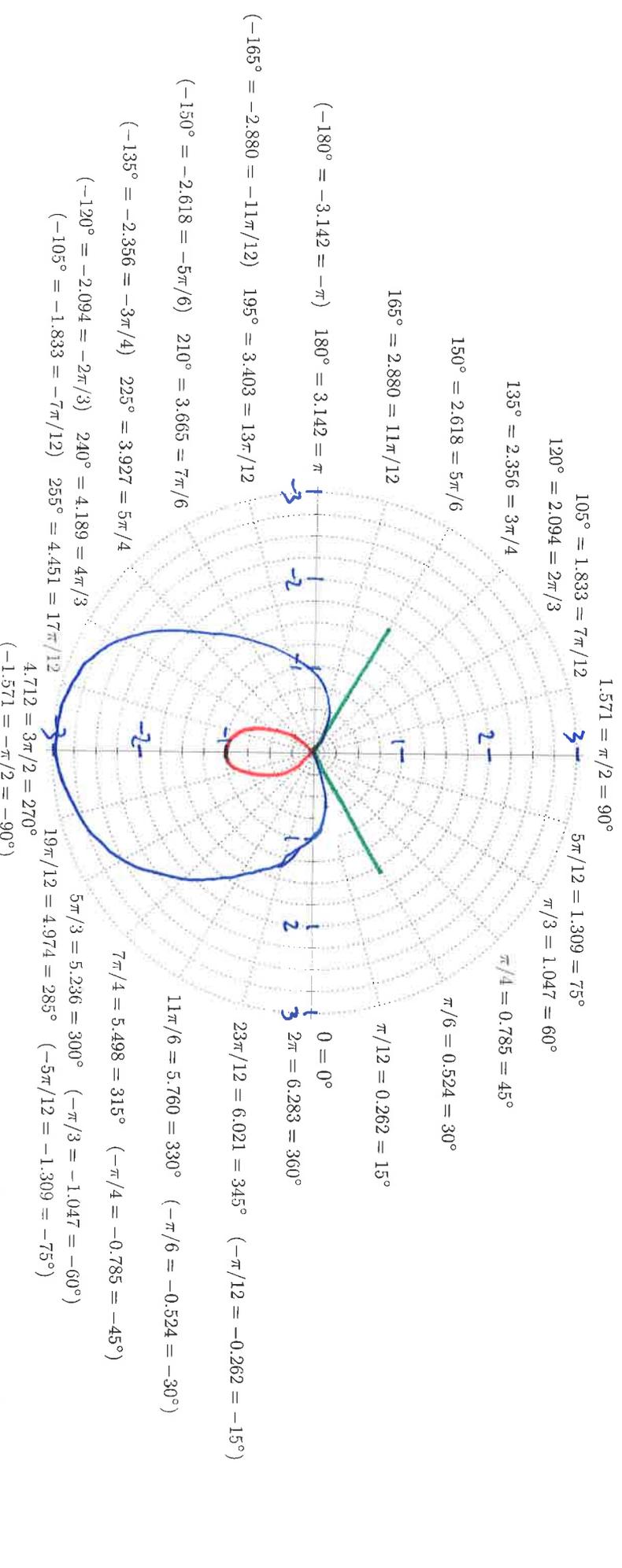
8.5.15



$r = 1 - 2\sin\theta$
 $r = 1 - 2\sin\theta = 0 \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = \frac{\pi}{6}, \frac{5\pi}{6}$

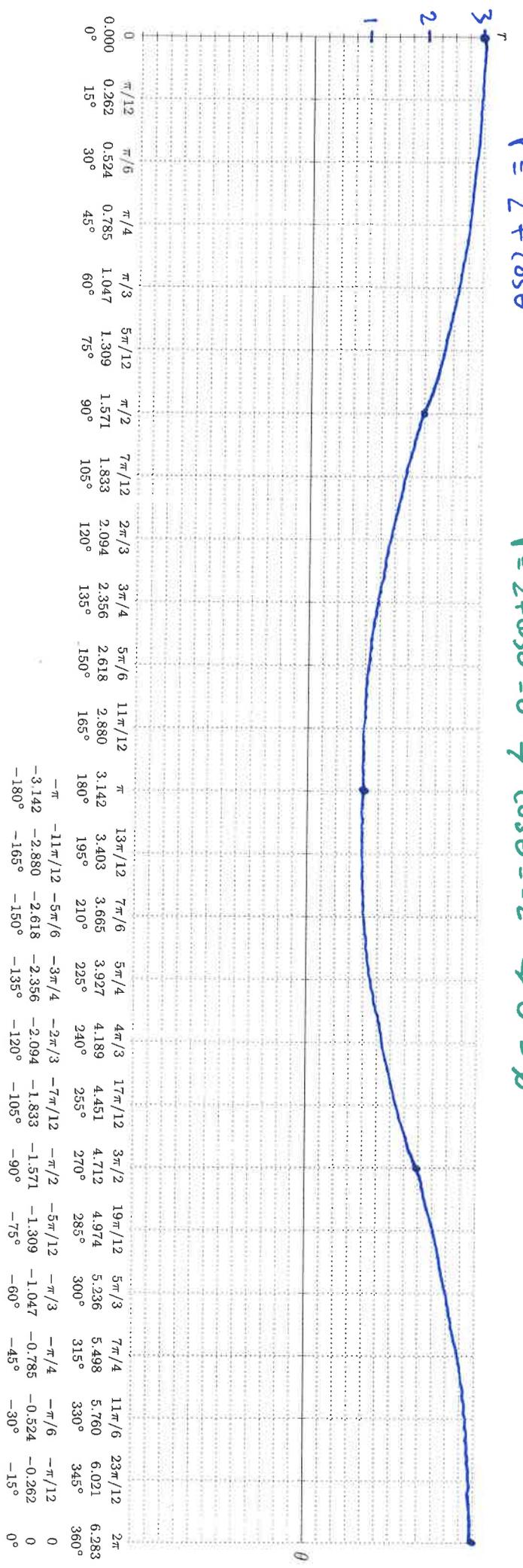


8.5.16

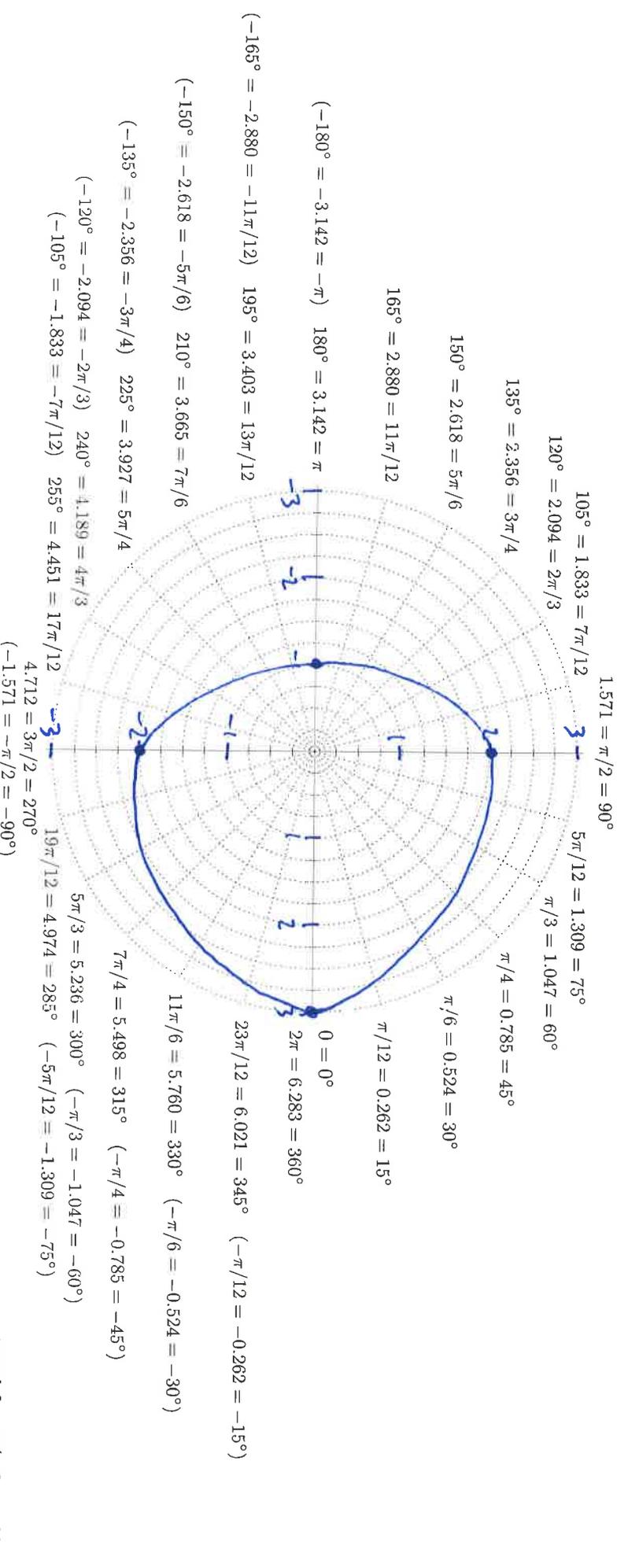


$$r = 2 + \cos \theta$$

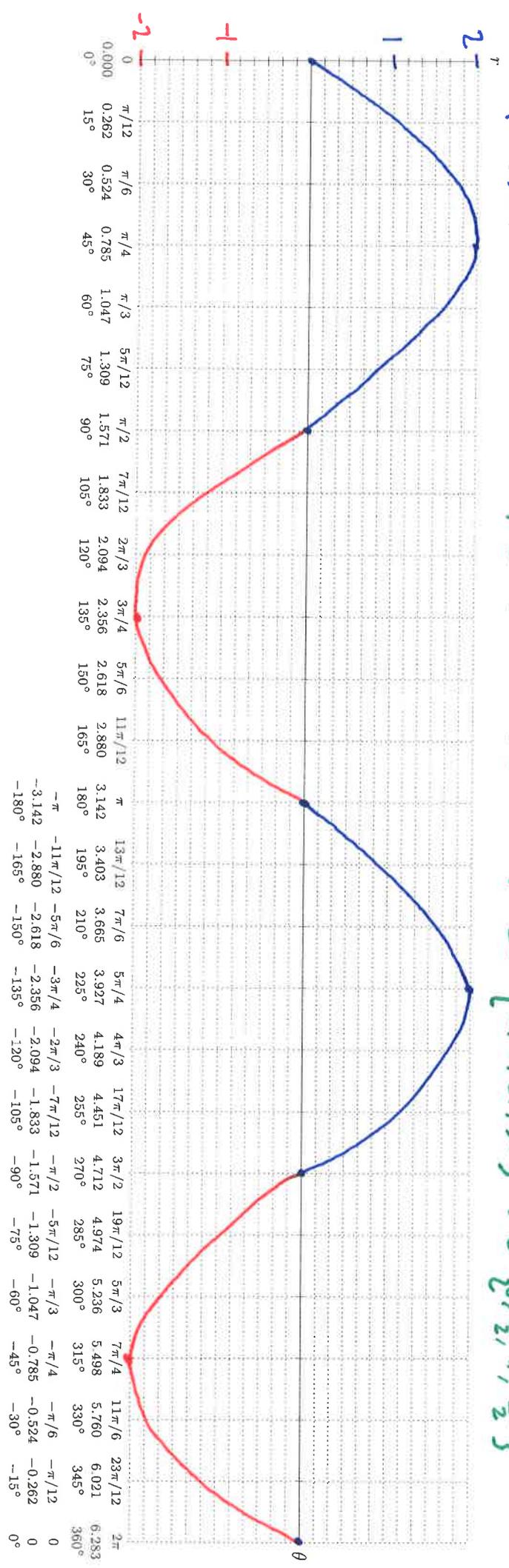
$$r = 2 + \cos \theta = 0 \Rightarrow \cos \theta = -2 \Rightarrow \theta = \emptyset$$



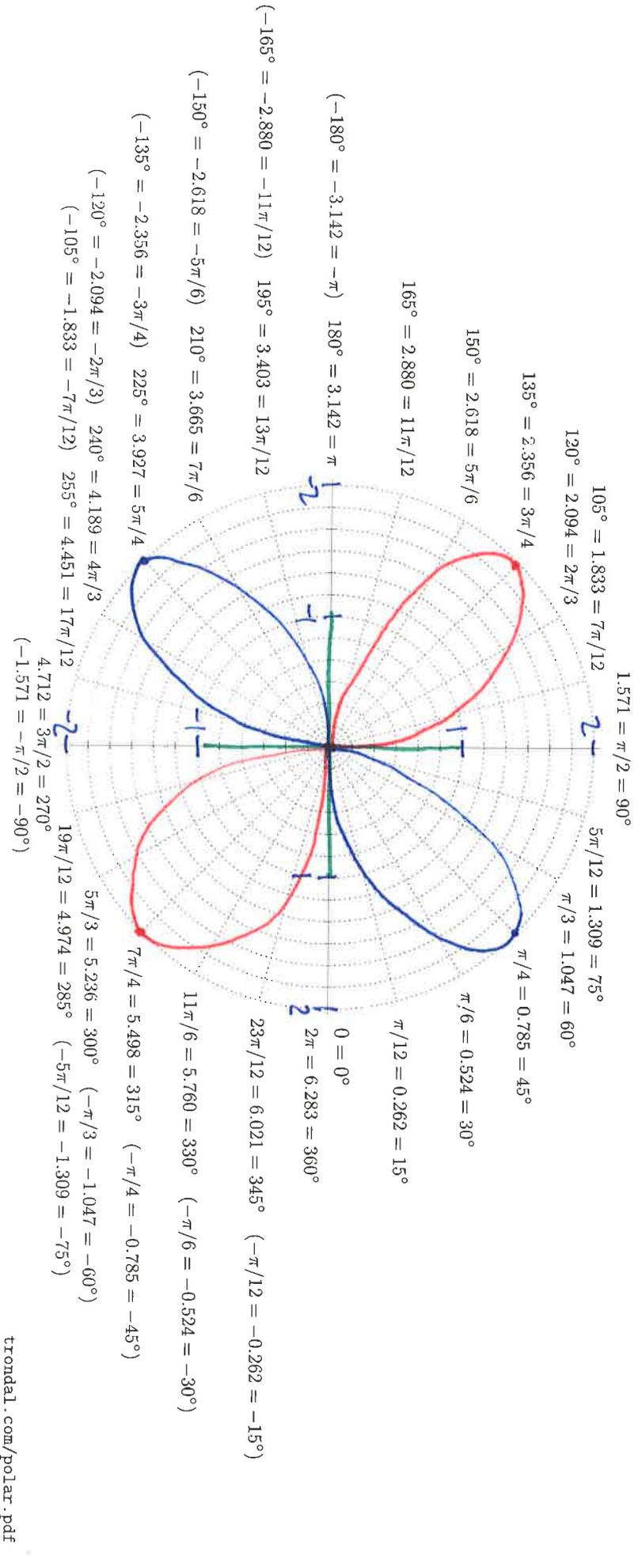
8.5.17



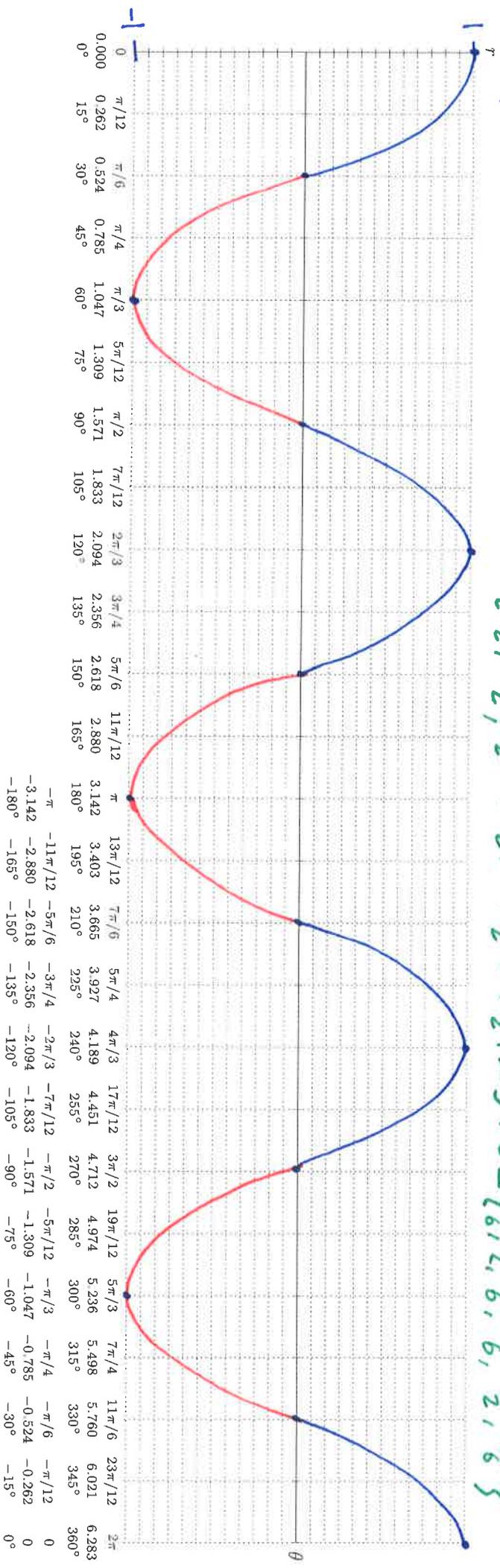
$r = 2 \sin 2\theta \Rightarrow \sin 2\theta = 0 \Rightarrow 2\theta = \{0, \pi, 2\pi, 3\pi\} \Rightarrow \theta = \{0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}\}$



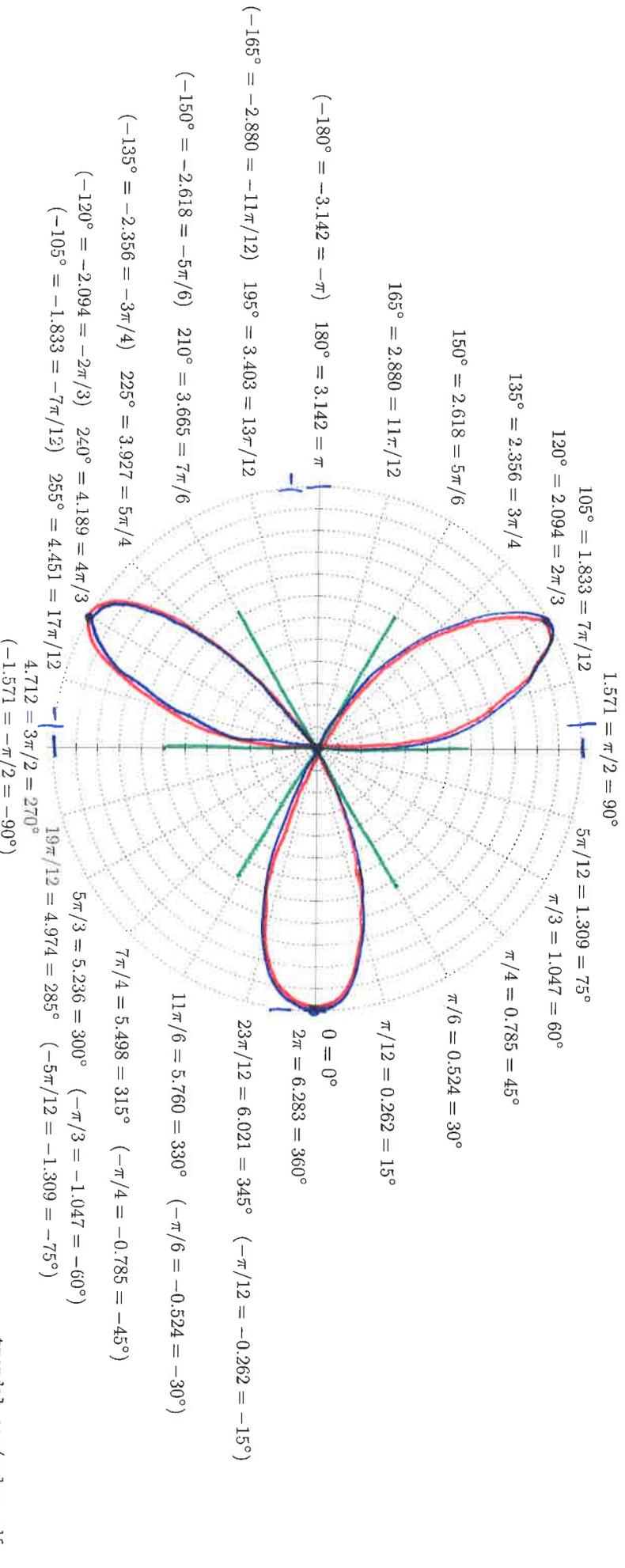
8.5.18



$r = \cos 3\theta \Rightarrow 3\theta = \left\{ \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{2} + 2\pi, \frac{3\pi}{2} + 2\pi, \frac{\pi}{2} + 3\pi, \frac{3\pi}{2} + 3\pi \right\} \Rightarrow \theta = \left\{ \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{3\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6} \right\}$

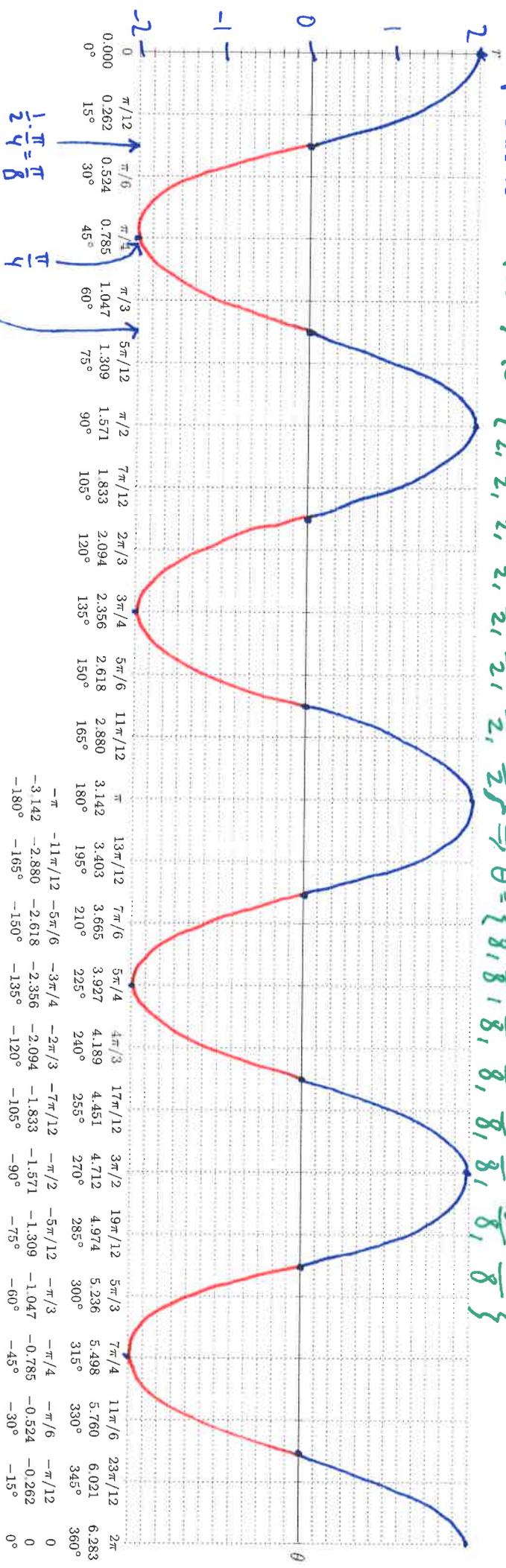


8.5.19



8.5.20

$r = 2 \cos 4\theta$ $r = 0 \Rightarrow 4\theta = \left\{ \frac{\pi}{8}, \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}, \frac{13\pi}{8}, \frac{15\pi}{8} \right\} \Rightarrow \theta = \left\{ \frac{\pi}{8}, \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}, \frac{13\pi}{8}, \frac{15\pi}{8} \right\}$



$\frac{1}{2} \left(\frac{\pi}{3} + \frac{5\pi}{12} \right) = \frac{3\pi}{8}$

