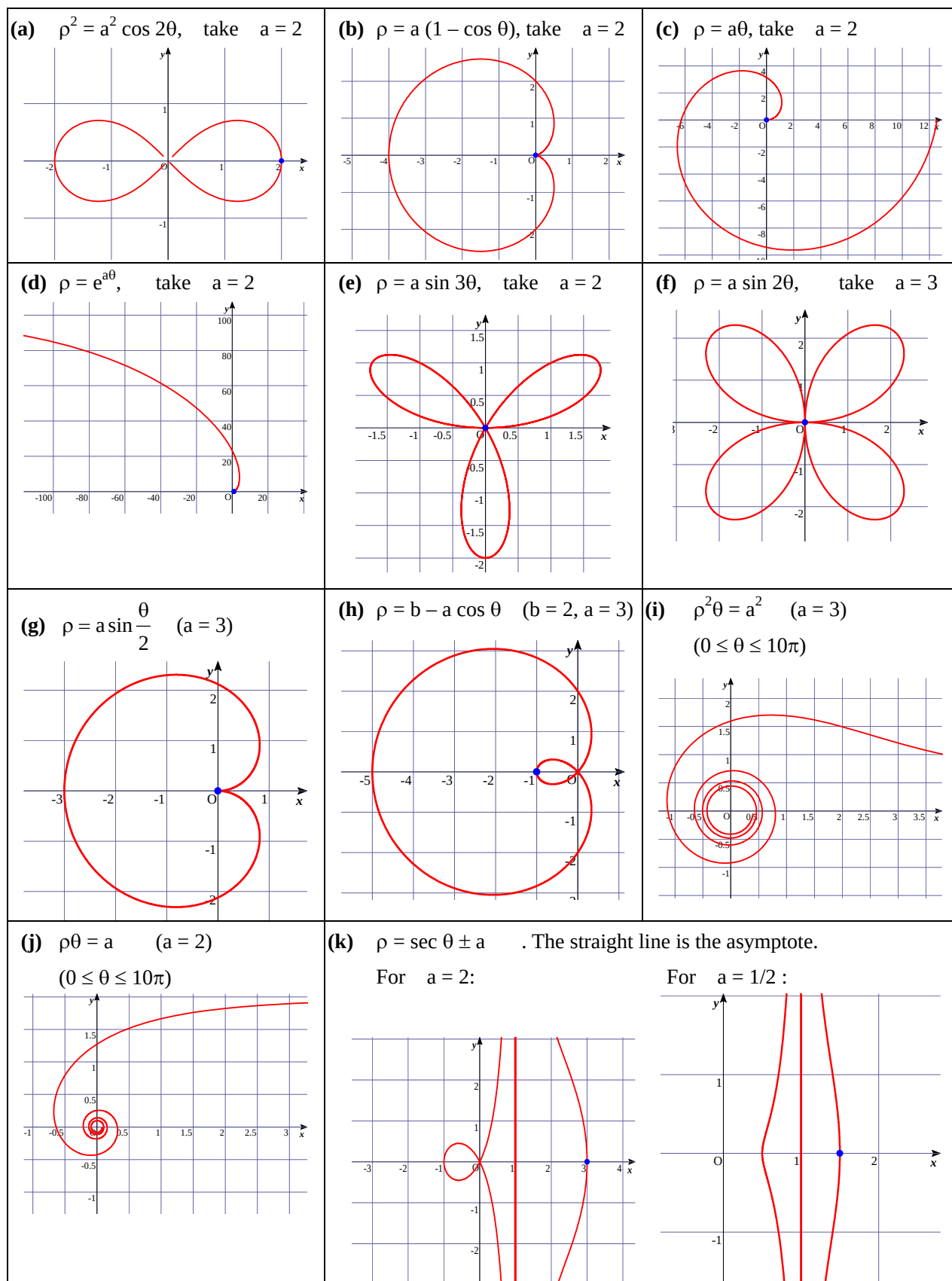


Functions and Graphs (Harder Polar and parametric graphs)

1.



2.

The graphs of $\rho = 2a(1 + \cos \theta)$ and $2\rho \cos \theta + a = 0$ with $a = 4$ are shown on the right hand side.

$$\rho = 2a(1 + \cos \theta) \quad (1)$$

$$2\rho \cos \theta + a = 0 \quad (2)$$

$$(1) \downarrow (2), \quad 4a(1 + \cos \theta) \cos \theta + a = 0$$

$$4 \cos \theta + 4 \cos^2 \theta + 1 = 0$$

$$4 \cos^2 \theta + 4 \cos \theta + 1 = 0$$

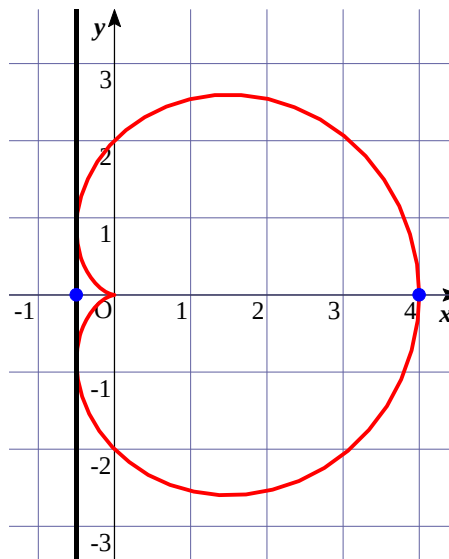
$$(2 \cos \theta + 1)^2 = 0$$

$$\therefore \cos \theta = -1/2 \quad (3)$$

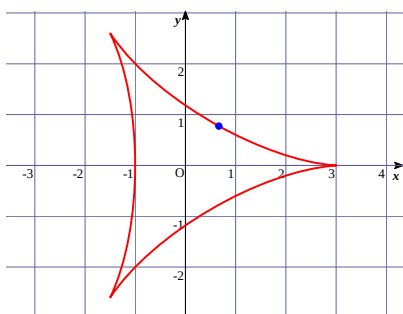
$$\therefore \theta = \frac{2\pi}{3}, \frac{4\pi}{3}$$

$$(3) \downarrow (1), \quad \rho = a.$$

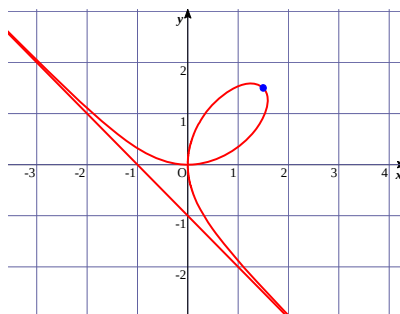
The intersection points are $\left(a, \frac{2\pi}{3}\right), \left(a, \frac{4\pi}{3}\right)$



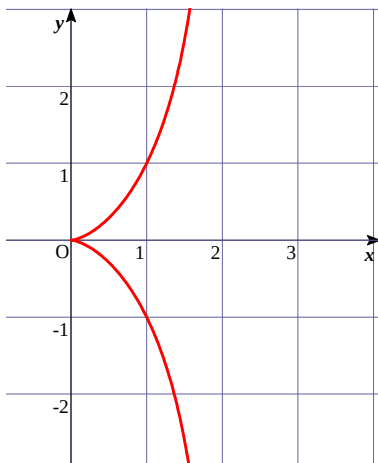
3. (a) Take $r = 1$ below:



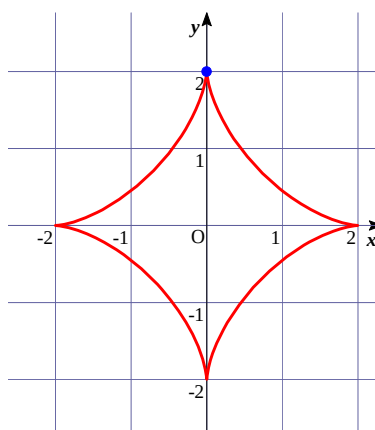
(b) Take $r = 1$ (The straight line is asymptote)



4. (a) $x = \frac{2at^2}{1+t^2}, y = \frac{2at^3}{1+t^2}$



(b) $x = a \sin^3 \theta, y = a \cos^3 \theta$



5.

