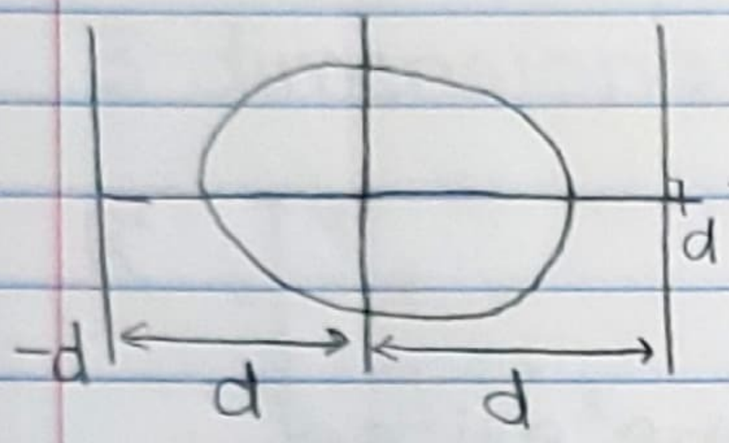
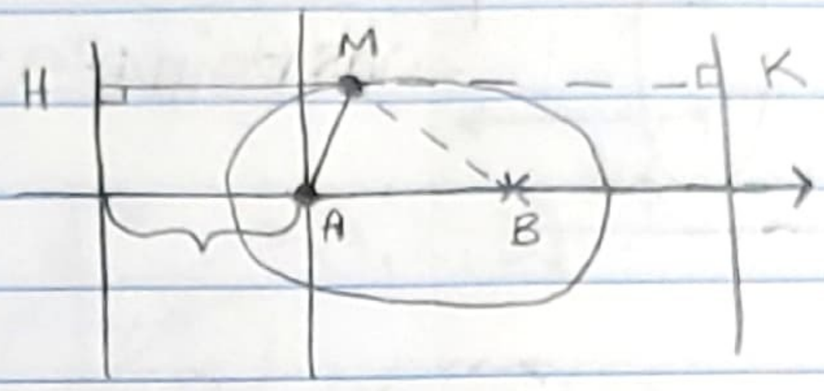
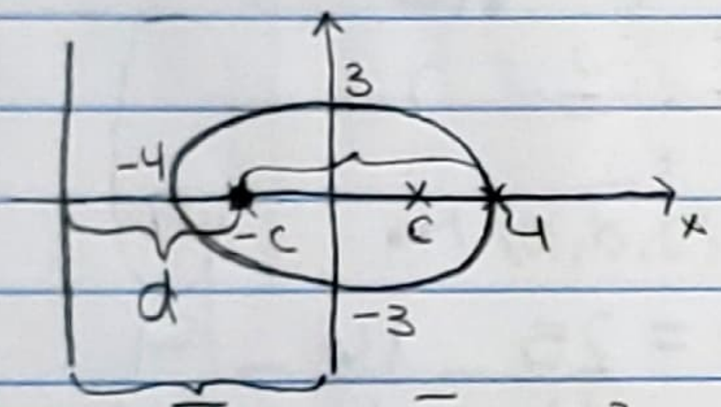
6/5/23





$$\frac{MA}{MH} = \frac{MB}{MK} = e$$

*cartesian coord



$$c = \sqrt{a^2 - b^2} = \sqrt{4^2 - 3^2} = \sqrt{7}$$

$$\bar{d} = \frac{a^2}{c} = \frac{4^2}{\sqrt{7}} = \frac{16}{\sqrt{7}}$$

$$d = \bar{d} - c = \frac{16}{\sqrt{7}} - \sqrt{7} =$$

$$= \frac{16-7}{\sqrt{7}} = \boxed{\frac{9}{\sqrt{7}}}$$

$$e = \frac{c}{a} = \frac{\sqrt{7}}{4}$$

$$r = \frac{ed}{1 \pm e\cos\theta} = \frac{\frac{\sqrt{7}}{4} \cdot \frac{9}{\sqrt{7}}}{1 \pm \frac{\sqrt{7}}{4}\cos\theta} = \frac{\frac{9}{4}}{1 \pm \frac{\sqrt{7}}{4}\cos} = \frac{9}{4 \pm \sqrt{7}\cos\theta}$$

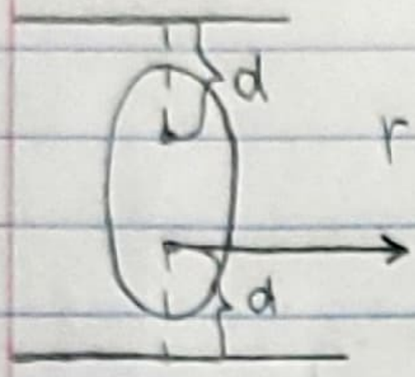
When $\theta = 0$, $r = 4 + \sqrt{7}$

$$r = \frac{9}{4 \pm \sqrt{7}} = 4 + \sqrt{7}$$

Pick the minus sign.

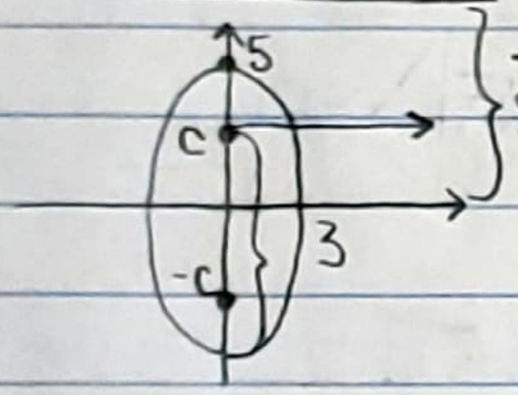
$$\boxed{r = \frac{9}{4 - \sqrt{7}\cos\theta}}$$

* If you pick the left focus as the pole, you would take the minus sign
* If you pick the right focus as the pole, you would take the plus sign



$$r = \frac{ed}{1 \pm r\sin\theta}$$

ex. Find polar equation of the ellipse.



$\bar{d}$

$c = \sqrt{25-9} = \sqrt{16} = 4$

$\bar{d} = \frac{25}{4}$

$d = \bar{d} - c = \frac{25}{4} - \frac{16}{4} = \frac{9}{4}$

$e = \frac{c}{a} = \frac{4}{5}$

$$r = \frac{\left(\frac{4}{5}\right)\left(\frac{9}{4}\right)}{1 \pm \frac{4}{5}\sin\theta} = \frac{\frac{9}{5}}{1 \pm \frac{4}{5}\sin\theta} = \frac{9}{5 \pm 4\sin\theta}$$

~~When $\theta = 0$, $r = 4+5$~~

~~$r = \frac{9}{5+4} = 4+5$~~

$\theta = \frac{\pi}{2} = 5-4 = 1$

$r = \frac{9}{5 \pm 4} = 1$

$$\boxed{r = \frac{9}{5+4\sin\theta}}$$

* If you take upper focus as pole, take plus sign
* vice versa

Vectors

3-dimensional space