

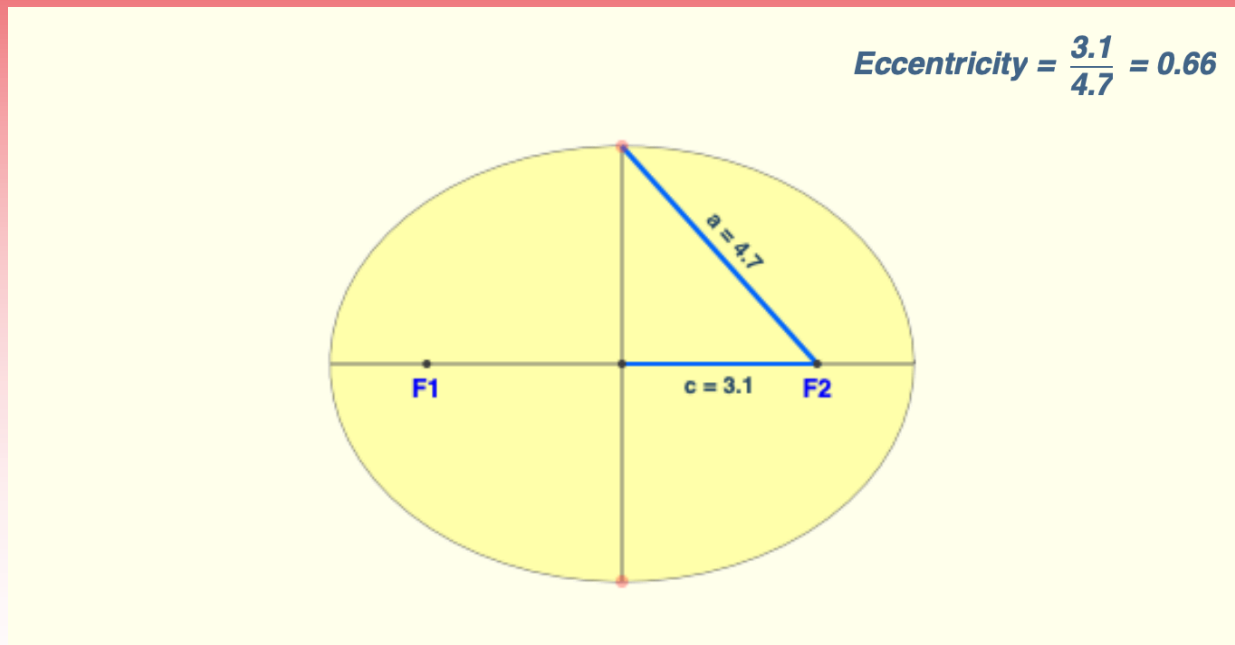
# Kepler's 2nd and 3rd Laws

*Physics 090*

*2020-03-13*



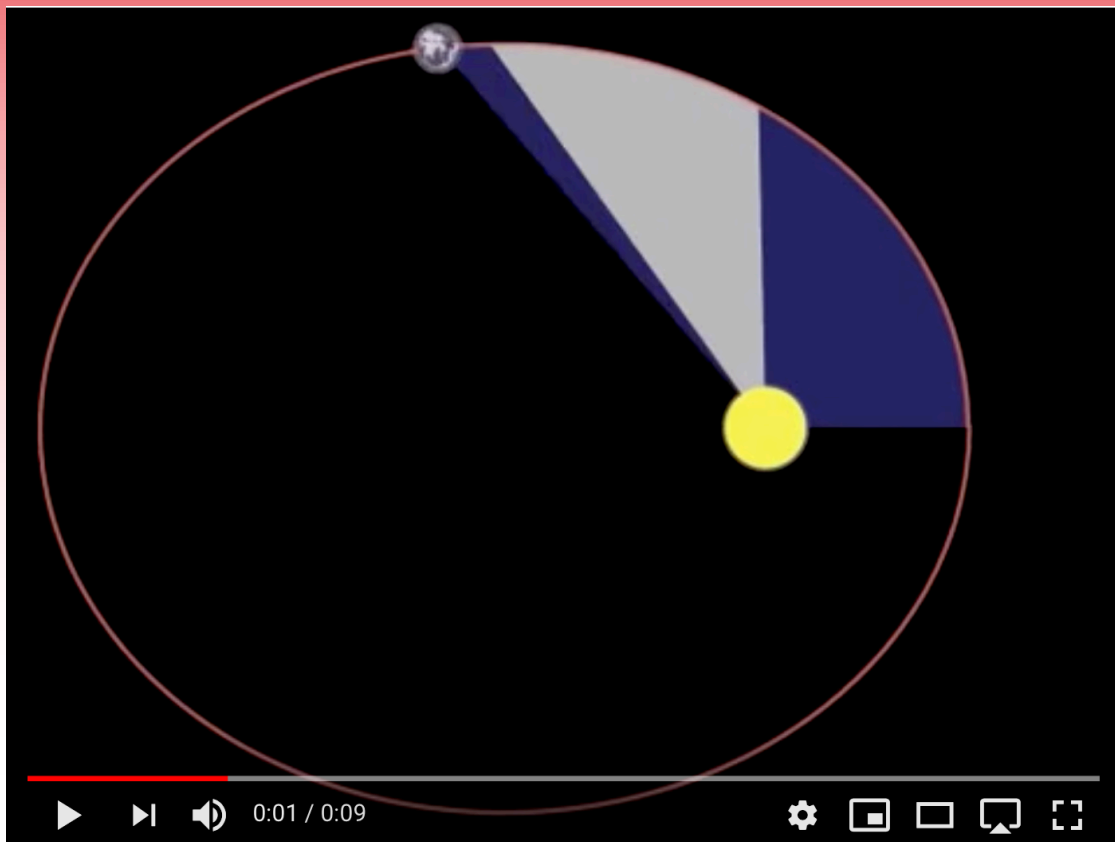
## More Properties of Ellipses



<https://www.mathopenref.com/ellipseeccentricity.html>

*Link is worth checking out to help understand  $a$ ,  $b$ ,  $c$ ,  $e$*

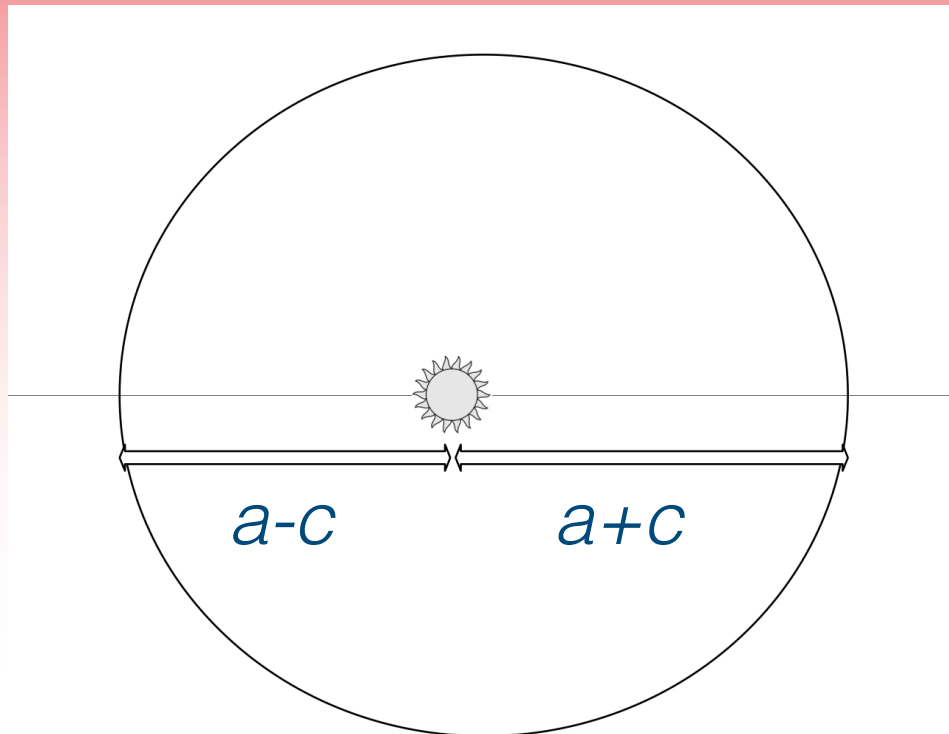
## Kepler's 2nd Law



[https://youtu.be/\\_30OK8a4l8Y](https://youtu.be/_30OK8a4l8Y)

## Minimum vs. Maximum Speed of the Earth

$a = 1 \text{ AU}$ ,  $e = c/a = 0.0167$ ,  $v_{\min} = 29.3 \text{ km/s}$



What is  $v_{\max}$ ? (Official value is 30.3 km/s.)

## Data for Kepler's Third Law

Planet	P (years)	a (AU)	P <sup>2</sup> (years <sup>2</sup> )	a <sup>3</sup> (AU <sup>3</sup> )
Mercury	0.241	0.387		
Venus	0.615	0.723		
Earth	1.000	1.000		
Mars	1.881	1.524		
Jupiter	11.862	5.203		
Saturn	29.458	9.537		