6-6 Videos Guide

6-6a

- Polar equation of a conic section
  - Horizontally oriented
    - $r = \frac{ed}{1 \pm e\cos\theta}$
  - Vertically oriented
    - $r = \frac{ed}{1 \pm e\sin\theta}$
- Description of the eccentricity e
  - $e = \frac{\text{distance from a point on the curve to the focus}}{\text{distance from the point to the directrix}}$
- Determining a conic section from the eccentricity e
  - Parabola if $e = 1$
  - Ellipse if $e < 1$
  - Hyperbola if $e > 1$

6-6b

Exercises:

- Write a polar equation of a conic with the focus at the origin and the given data.
  - Parabola, directrix $x = -3$
  - Ellipse, eccentricity 0.6, directrix $r = 4\csc\theta$
- Find the eccentricity, (b) identify the conic, (c) give an equation of the directrix, and (d) sketch the conic.

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

6-6c

Exercise:

- Find the eccentricity, (b) identify the conic, (c) give an equation of the directrix, and (d) sketch the conic.

  $r = \frac{5}{2 - 4\cos\theta}$

6-6d

- Polar equations of orbits
  - $r = \frac{a(1-e^2)}{1+e\cos\theta}$, where a is the length of the semimajor axis
  - Perihelion (closest) distance: $r = a(1 - e)$
  - Aphelion (farthest) distance: $r = a(1 + e)$

Exercise:

- Jupiter's orbit has eccentricity 0.048 and the length of the major axis is 1.56×10^9 km. Find a polar equation for the orbit.