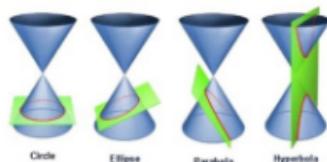


**Keeper #7: General → Standard Form (circles and ellipses)**

Conic Sections - Four Types

**Find the center and radius:**

$$(x-5)^2 + (y+3)^2 = 15 \quad \frac{(x+1)^2}{4} + \frac{(y-4)^2}{25} = 1$$

$$C: (5, -3)$$

$$r = \sqrt{15}$$

Find the center, vertices, and co-vertices:

$$C: (-1, 4)$$

$$\text{Co-v: } (1, 4)$$

$$(-3, 4)$$

State the coordinates of the foci:

$$\frac{(x-3)^2}{9} + (y+6)^2 = 1$$

$$c^2 = a^2 - b^2$$

$$c^2 = 9 - 1$$

$$c^2 = 8$$

$$c = 2\sqrt{2}$$

≈ 2.8

$$(3, -6)$$

$$(3+2\sqrt{2}, -6)$$

$$(3-2\sqrt{2}, -6)$$

$$\checkmark (-1, 9)$$

$$(-1, -1)$$

Yesterday Recap
Vertices: on major axis, larger denominator, foci on same axis

Co-vertices: on minor axis, small denom.

Foci: inside of ellipse, major axis, $c^2 = a^2 - b^2 \leftarrow$ denominators

Major axis: vertices and foci, largest distance from center

Minor axis: co-vertices, shortest distance from center

Eccentricity:

$\frac{c}{b}$
 bigger number

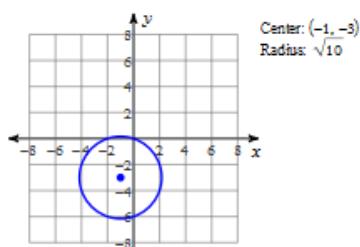
Completing the Square (remember??)

$$\frac{6}{2} = 3^2 = 9 \quad x^2 + 6x + \underline{\underline{9}} + y^2 - 8y + \underline{\underline{16}} = 11 + \underline{\underline{9}} + \underline{\underline{16}} \quad \left(\frac{b}{2}\right)^2 = (-4)^2 = 16 \quad (x+3)^2 + (y-4)^2 = 36$$

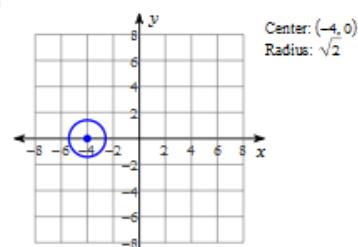
Ex. $2x^2 - 8x + \underline{\underline{16}} + 5y^2 - 30y = 30 + \underline{\underline{16}} + \underline{\underline{45}}$

$$5(y^2 - 6y + 9)$$

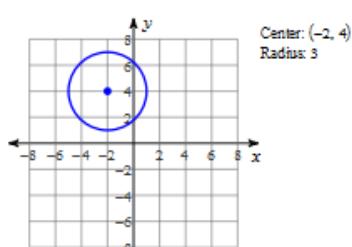
1)



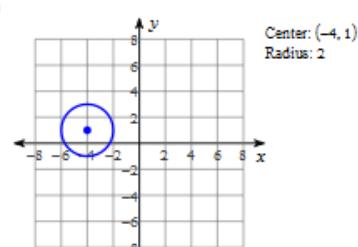
2)



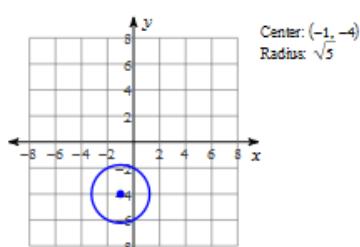
3)



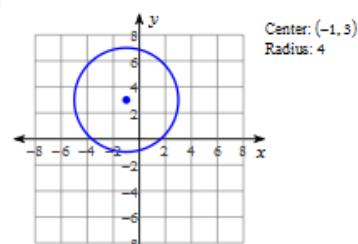
4)



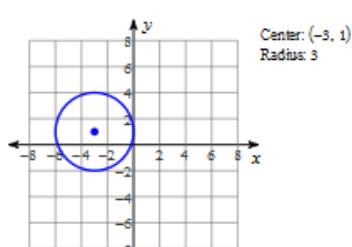
5)



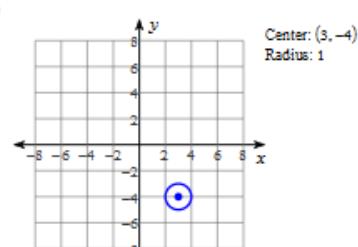
6)



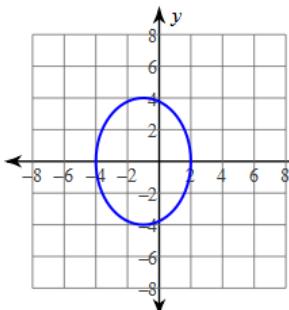
7)



8)

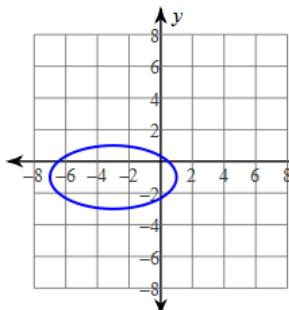


1)



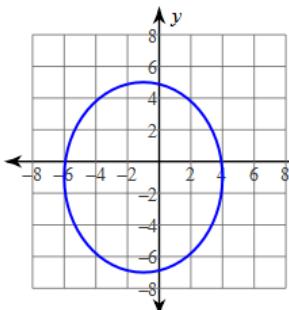
Center: $(-1, 0)$
 Vertices: $(-1, 4)$
 $(-1, -4)$
 Co-vertices: $(2, 0)$
 $(-4, 0)$
 Foci: $(-1, \sqrt{7})$
 $(-1, -\sqrt{7})$
 Major Axis: 8 units
 Minor Axis: 6 units
 Eccentricity: $\frac{\sqrt{7}}{4} \approx 0.661$

2)



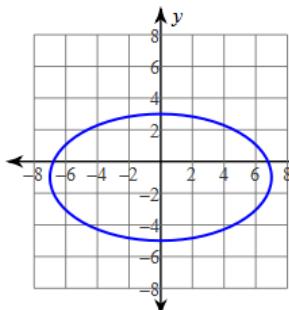
Center: $(-3, -1)$
 Vertices: $(1, -1)$
 $(-7, -1)$
 Co-vertices: $(-3, 1)$
 $(-3, -3)$
 Foci: $(-3 + 2\sqrt{3}, -1)$
 $(-3 - 2\sqrt{3}, -1)$
 Major Axis: 8 units
 Minor Axis: 4 units
 Eccentricity: $\frac{\sqrt{3}}{2} \approx 0.866$

3)



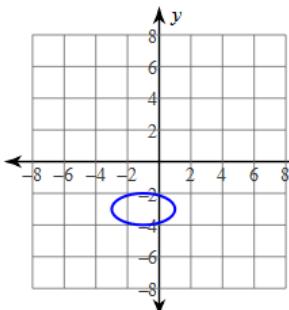
Center: $(-1, -1)$
 Vertices: $(-1, 5)$
 $(-1, -7)$
 Co-vertices: $(4, -1)$
 $(-6, -1)$
 Foci: $(-1, -1 + \sqrt{11})$
 $(-1, -1 - \sqrt{11})$
 Major Axis: 12 units
 Minor Axis: 10 units
 Eccentricity: $\frac{\sqrt{11}}{6} \approx 0.553$

4)



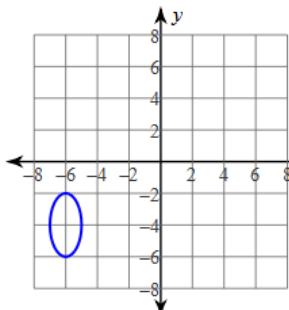
Center: $(0, -1)$
 Vertices: $(7, -1)$
 $(-7, -1)$
 Co-vertices: $(0, 3)$
 $(0, -5)$
 Foci: $(\sqrt{33}, -1)$
 $(-\sqrt{33}, -1)$
 Major Axis: 14 units
 Minor Axis: 8 units
 Eccentricity: $\frac{\sqrt{33}}{7} \approx 0.821$

5)



Center: $(-1, -3)$
 Vertices: $(1, -3)$
 $(-3, -3)$
 Co-vertices: $(-1, -2)$
 $(-1, -4)$
 Foci: $(-1 + \sqrt{3}, -3)$
 $(-1 - \sqrt{3}, -3)$
 Major Axis: 4 units
 Minor Axis: 2 units
 Eccentricity: $\frac{\sqrt{3}}{2} \approx 0.866$

6)



Center: $(-6, -4)$
 Vertices: $(-6, -2)$
 $(-6, -6)$
 Co-vertices: $(-5, -4)$
 $(-7, -4)$
 Foci: $(-6, -4 + \sqrt{3})$
 $(-6, -4 - \sqrt{3})$
 Major Axis: 4 units
 Minor Axis: 2 units
 Eccentricity: $\frac{\sqrt{3}}{2} \approx 0.866$



College Spotlight



Out of state tuition: \$8,644

4,800 students

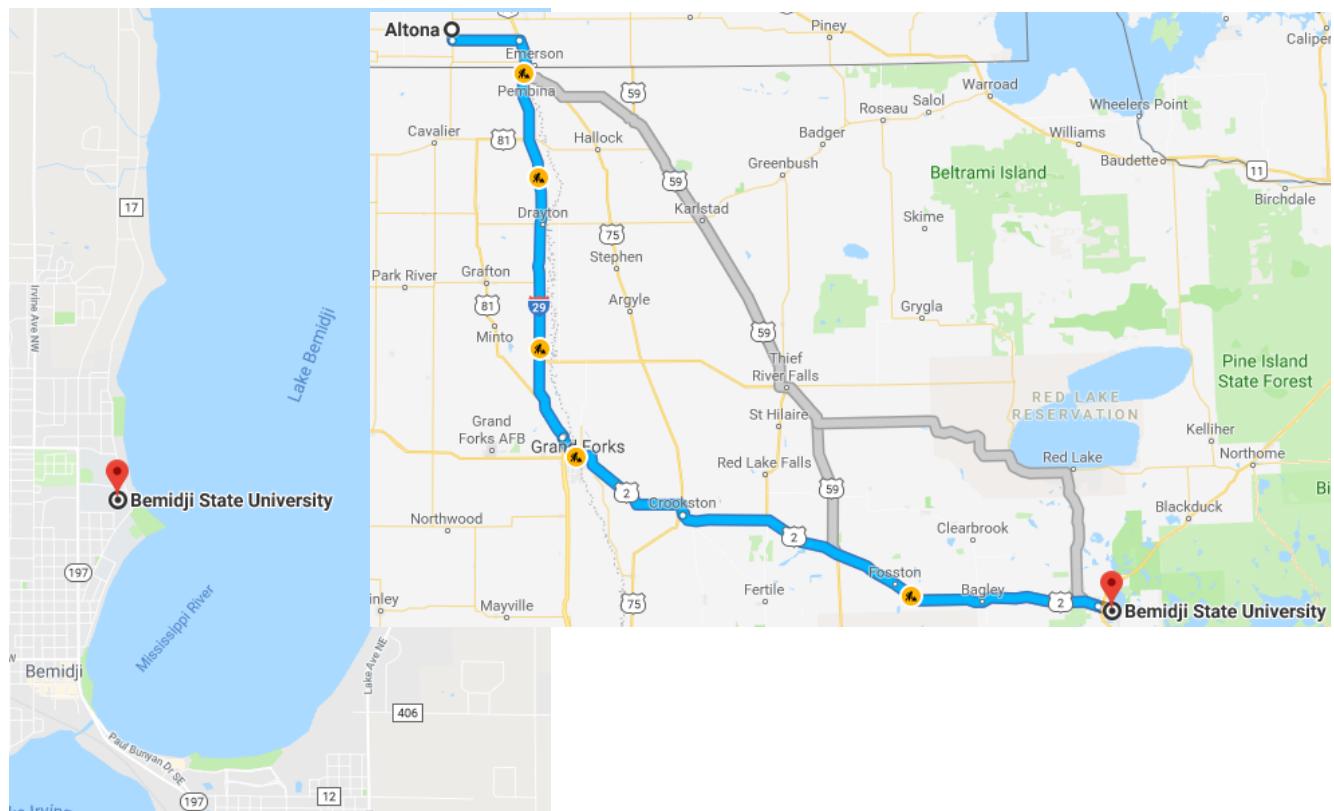
57% female

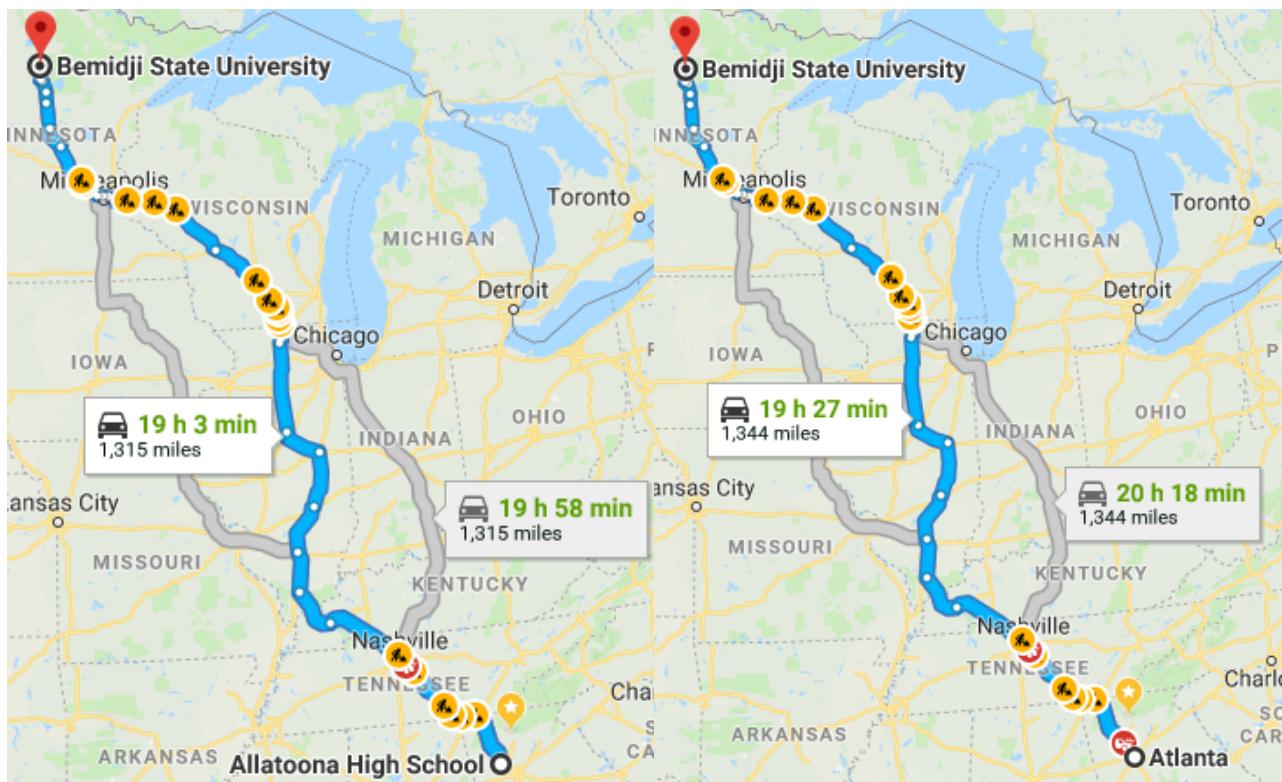
**Ranked #109 in
regional midwest
universities**

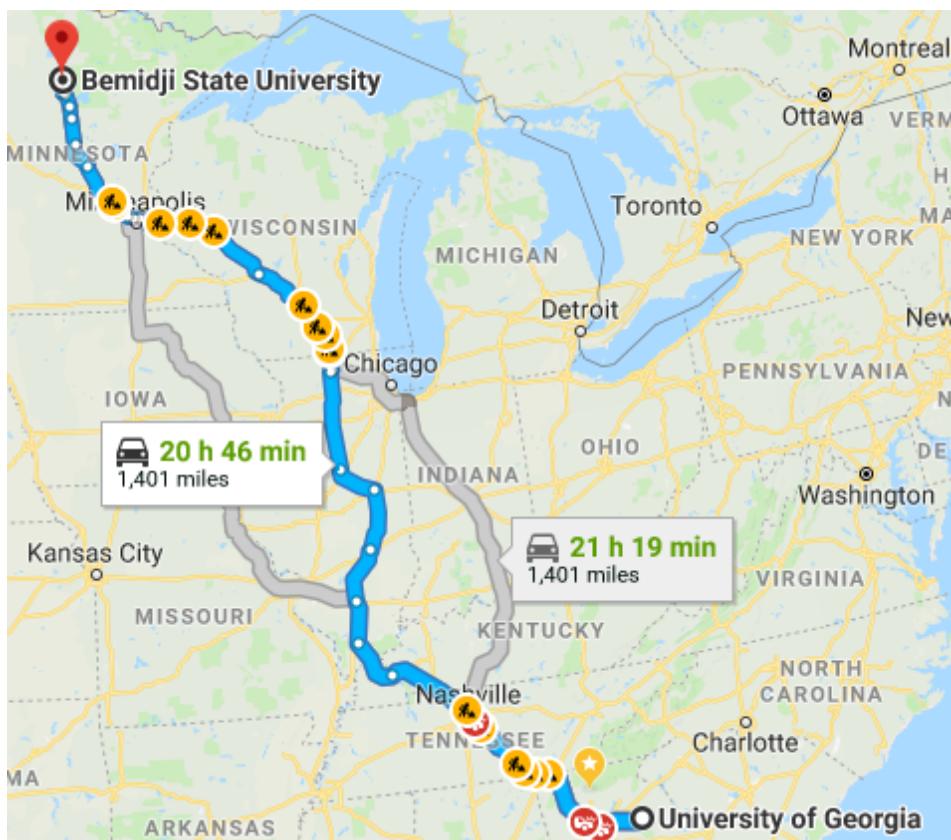
Division-II sports

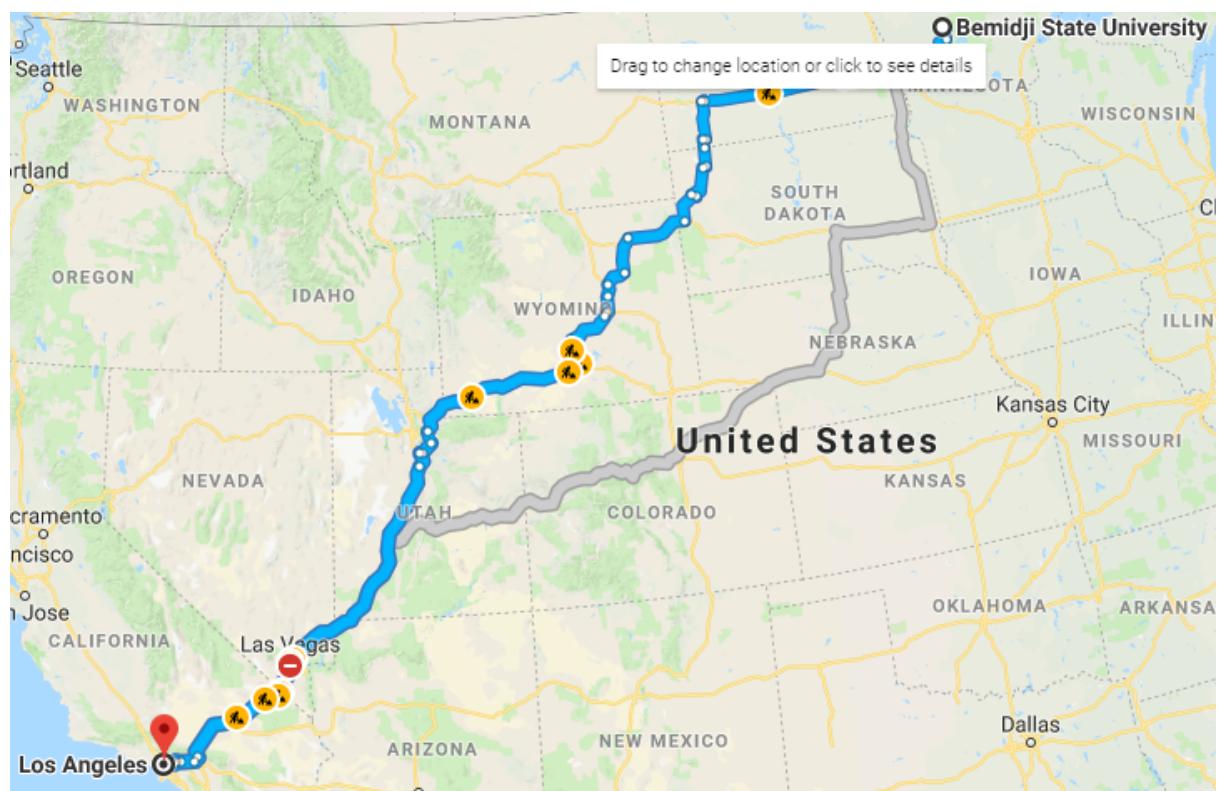
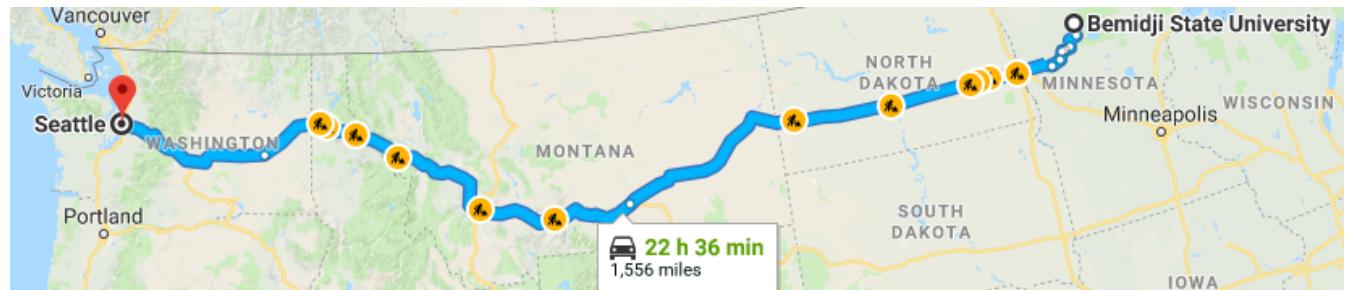
- football, baseball,
**basketball, w soccer, ice
hockey**

**Business management,
education, health fields**









$$\begin{aligned}x^2 + y^2 + 6x - 2y - 6 &= 0 + 6 \\x^2 + 6x + \underline{9} + y^2 - 2y + \underline{1} &= 6 + \underline{9} + \underline{1} \\(x+3)^2 + (y-1)^2 &= 16\end{aligned}$$

$C: (-3, 1)$
 $r = 4$

$$\begin{aligned}x^2 + y^2 - 8y + \underline{16} &= -7 + 16 \\x^2 + (y-4)^2 &= 9 \\(0, 4) &\quad r = 3\end{aligned}$$

$$x^2 + 8x + \underline{16} + y^2 - 4y + \underline{4} = -19$$

+16
+4

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

$$C: (-4, 2)$$

$$r = 1$$

$$4x^2 + 24x + \underline{\quad} + 4y^2 + 12y + \underline{\quad} = 19$$

$$4(x^2 + 6x + \underline{9} + y^2 + 3y + \underline{2.25}) = 19$$

$\quad\quad\quad + 36$
 $\quad\quad\quad + 9$

$$\frac{4}{4}(x+3)^2 + \frac{4}{4}(y+1.5)^2 = \frac{64}{4}$$

$$(x+3)^2 + (y+1.5)^2 = 16$$

$$C: (-3, -1.5)$$

$$r = 4$$

$$\begin{aligned}x^2 + 9y^2 + 36y &= 0 \\x^2 + 9(y^2 + 4y + \frac{4}{9}) &= 0 + 36 \\x^2 + 9(y+2)^2 &= 36 \\ \hline \frac{x^2}{36} + \frac{(y+2)^2}{4} &= 1\end{aligned}$$

$$16x^2 + 25y^2 - 50y = 375$$

$$16x^2 + 25(y^2 - 2y + \frac{1}{4}) = 375$$

$(y-1)(y-1)$

$$+ 25$$

$$\frac{16x^2 + 25(y-1)^2}{400} = \frac{400}{400}$$

$$\frac{x^2}{25} + \frac{(y-1)^2}{16} = 1$$