

Lesson 87 Objective: SWBAT graph and write equations of an ellipse.

Kickoff- Identify each equation and any key features of the graph of the equation

$(x-h)^2 = 4p(y-k)$ Vertical Parabola
 $(y-k)^2 = 4p(x-h)$ Horizontal Parabola
 $(x-h)^2 + (y-k)^2 = r^2$ Circle
 Center and radius

$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$ horizontal ellipse
 $\frac{(y-k)^2}{a^2} + \frac{(x-h)^2}{b^2} = 1$ vertical ellipse

Focus, Directrix, Vertex, LOS
 Foci (2), (4) vertices, Center, major axis, minor axis
 $a^2 = b^2 + c^2$

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Horizontal Major Axis: $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

Vertical Major Axis: $\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$

Directions: Identify the vertices, foci and center of the ellipse. Then sketch its graph.

1) $\frac{(x-1)^2}{16} + \frac{(y-1)^2}{25} = 1$ vertical ellipse
 Center $C(1,1)$
 $a=5$
 $b=4$
 Vertices $(1,6)$ $(5,1)$ $(1,-4)$ $(-3,1)$
 $a^2 = b^2 + c^2$
 $25 = 16 + c^2$
 $9 = c^2$
 $3 = c$
 Foci $(1,4)$ $(1,-2)$

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3) $(x-2)^2 + 4(y+2)^2 = 16$

$\frac{(x-2)^2}{16} + \frac{(y+2)^2}{4} = 1$
 Center $C(2,-2)$
 $a=4$ $b=2$
 $16 = 4 + c^2$
 $12 = c^2$
 $\sqrt{12} = c \rightarrow \sqrt{12} = 2\sqrt{3}$
 Foci $(2 \pm 2\sqrt{3}, -2)$

4) $\frac{(x+1)^2}{9} + \frac{y^2}{49} = 1$

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Directions: Use the key features provided to find the equation of the ellipse.

5) Vertices: $(1,2), (1,-8)$
 $(7,2), (-5,2)$

6) Foci: $(-1,9), (-1,-9)$
 $(7,2), (-5,2)$

Center $C(6,9)$
 non horizontal
 $a=?$
 $b=5$
 $c=8\sqrt{6}$
 $a^2 = b^2 + c^2$
 $a^2 = 25 + (8\sqrt{6})^2$
 $a^2 = 25 + 24$
 $a^2 = 49$
 $a=7$
 Equation: $\frac{(x+6)^2}{49} + \frac{(y-9)^2}{25} = 1$

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Directions: Use the information provided to write the standard form equation of each ellipse. Then determine the center, a, and b values, foci and determine if the ellipse has a horizontal or vertical major axis.

7) $x^2 - 16y^2 - 2x - 96y + 129 = 0$

$(x^2 - 2x) + (-16y^2 - 96y) = -129$
 $(x+1)^2 + 16(y-6y) = -1144$
 $(x+1)^2 + 16(y-3)^2 = 16$
 $\frac{(x+1)^2}{16} + \frac{(y-3)^2}{1} = 1$

8) $4x^2 + 9y^2 + 32x - 36y + 64 = 0$

$4x^2 + 32x + 9y^2 - 36y = -64$
 $4(x^2 + 8x) + 9(y^2 - 4y) = -64$
 $4(x+4)^2 + 9(y-2)^2 = 64$
 $\frac{4(x+4)^2}{64} + \frac{9(y-2)^2}{64} = 1$
 $\frac{(x+4)^2}{16} + \frac{(y-2)^2}{\frac{64}{9}} = 1$

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