PreCalculus Name________________________________

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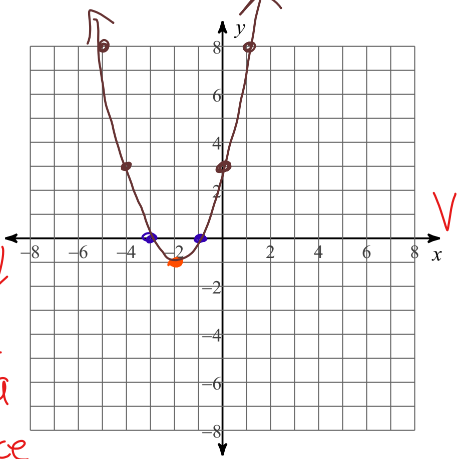
Conic Sections - Circles, Parabolas and Ellipses

Date________________ Period___

Identify the vertex, focus, directrix, direction of opening, min/max value, y-intercept, and x-intercepts of each. Then sketch the graph.

1) $-x^2 - 4x + y - 3 = 0$



$y-3 = x^2+4x \underline{+4}$

$+4$

$\boxed{y+1 = (x+2)^2}$

V $(-2,-1)$ $p = \frac{1}{4(1)} = \frac{1}{4}$

Focus $\left(-2, -\frac{3}{4}\right)$

Directrix $y = -\frac{5}{4}$

up

minimum is -1

y-int. $(x=0)$

$y+1=(0+2)^2$

$y+1=4$

$y=3$ $(0,3)$

Focal length

$p = \frac{1}{4a}$ distance from vertex to focus

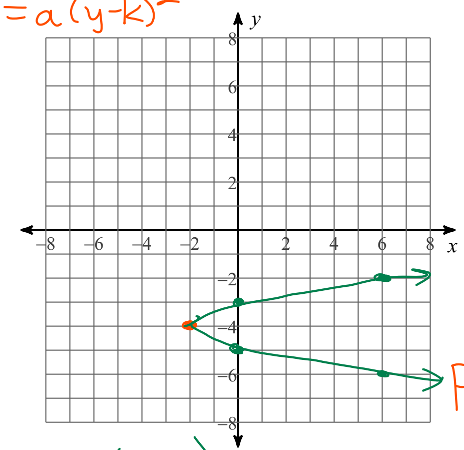
X-int. $(y=0) \rightarrow \sqrt{0+1} = \sqrt{(x+2)^2}$

$\pm 1 = x+2 \rightarrow x = -2 \pm 1$ $(-1,0)$ $(-3,0)$

Identify the vertex, focus, directrix, direction of opening, min/max value, x-intercept, and y-intercepts of each. Then sketch the graph.

2) $-2y^2 + x - 16y - 30 = 0$

$(x-h) = a(y-k)^2$



$x-30 = 2y^2+16y \underline{+32}$

$+32$

$= 2(y^2+8y \underline{+16})$

$\boxed{x+2 = 2(y+4)^2}$

V $(-2,-4)$ Focus $\left(-1\frac{7}{8}, -4\right)$

$p = \frac{1}{4(2)} = \frac{1}{8}$ Directrix: $x = -2\frac{1}{8}$

X-int $(y=0)$ $x+2=2(0+4)^2$

$x+2=2(16)$

$x+2=32$

$(30,0)$

y-int $(x=0)$

$0+2=2(y+4)^2$

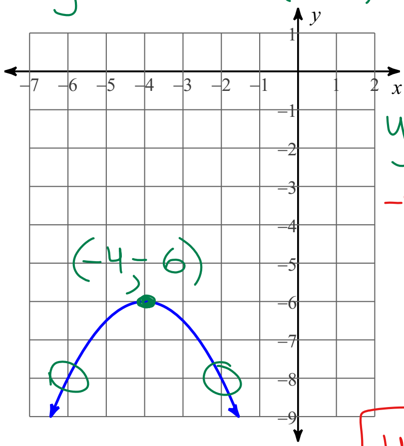
$\sqrt{1} = \sqrt{(y+4)^2}$

$\pm 1 = y+4 \rightarrow y = -4 \pm 1$

$(0,-5)$ $(0,-3)$

Use the information provided to write the vertex form equation of each parabola.

3) $y-k=a(x-h)^2$



$y+6=a(x+4)^2$

$-8+6=a(-2+4)^2$

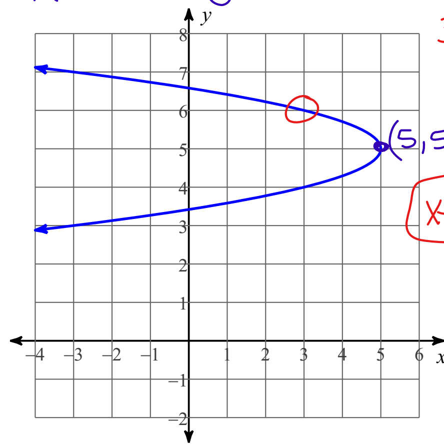
$-2=a(2)^2$

$-2=a4$

$a=-\frac{1}{2}$

$\boxed{y+6=-\frac{1}{2}(x+4)^2}$

4) $x-h=a(y-k)^2$



$x-5=a(y-5)^2$

$3-5=a(6-5)^2$

$-2=a(1)^2$

$a=-2$

$\boxed{x-5=-2(y-5)^2}$

Use the information provided to write the standard form equation of each circle.

5) ~~$6x=-144-24y-x^2-y^2$~~

~~Translated 2 left, 5 down~~

$x^2+6x+9 \quad y^2+24y+144=-144+9+144$

$(x+3)^2+(y+12)^2=9$

$\boxed{(x+5)^2+(y+17)^2=9}$

6) Three points on the circle:
$(-5, 18)$, $(3, -12)$, and $(-16, -1)$

$(-5-h)^2+(18-k)^2=(3-h)^2+(-12-k)^2$

$25+10h+h^2+324-36k+k^2=9-6h+h^2+144+24k+k^2$

$349+10h-36k=153-6h+24k$

$(-16-h)^2+(-1-k)^2=256+32h+1+2k=257+32h+2k$

$$\begin{array}{r} 349 \\ -153 \\ \hline 196 \end{array}$$

$\boxed{196=-16h+60k}$

$257+32h+2k=153-6h+24k$
$-153-32h-2k \quad -153-32h-2k$

$\boxed{104=-38h+22k}$

$196=-16(1)+60k$
$180=60k$
$k=3$

$196=-16h+60k \rightarrow (49=-4h+15k)\cdot 11 \rightarrow 539=44h+165k$

$104=-38h+22k \quad (52=-19h+11k)\cdot -15 \rightarrow -780=285h-165k$

$-241=241h$
$h=-1$

$$\begin{array}{r} 1 \\ 52 \\ 15 \\ \hline 260 \\ 52 \\ \hline 780 \end{array} \qquad \begin{array}{r} 780 \\ -539 \\ \hline 241 \end{array}$$

$(x+1)^2+(y-3)^2=r^2$

$(-5+1)^2+(18-3)^2=r^2$

$(-4)^2+15^2=r^2 \rightarrow 16+225=241$

$\boxed{(x+1)^2+(y-3)^2=241}$

Use the information provided to write the standard form equation of each ellipse.

7) $60x + 14y = -79 - 6x^2 - y^2$

$6x^2 + 60x \underline{+150} + y^2 + 14y \underline{+49} = -79 + 49 + 150$

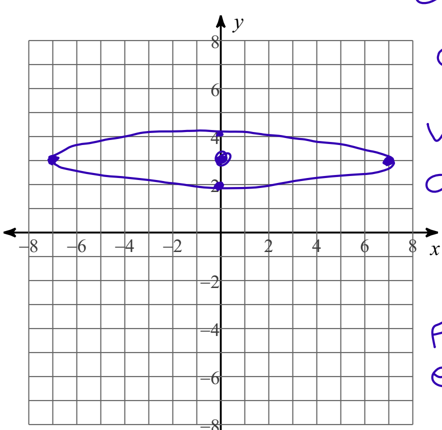
$6(x^2 + 10x \underline{+25}) + (y+7)^2$

$\frac{6(x+5)^2}{120} + \frac{(y+7)^2}{120} = \frac{120}{120}$

$\boxed{\frac{(x+5)^2}{20} + \frac{(y+7)^2}{120} = 1}$

Identify the center, vertices, co-vertices, foci, and eccentricity of each. Then sketch the graph.

8) $49y^2 = -392 + 294y - x^2$



c $(0, 3)$

$a = 7$, $b = 1$

vertices $(7, 3)$ $(-7, 3)$

co-vert $(0, 4)$ $(0, 2)$

$a^2 - b^2 = 49 - 1 = 48$

$c^2 = 48$ $c = 4\sqrt{3}$

Foci $(0 \pm 4\sqrt{3}, 3)$

$e = \frac{c}{a} = \frac{4\sqrt{3}}{7}$

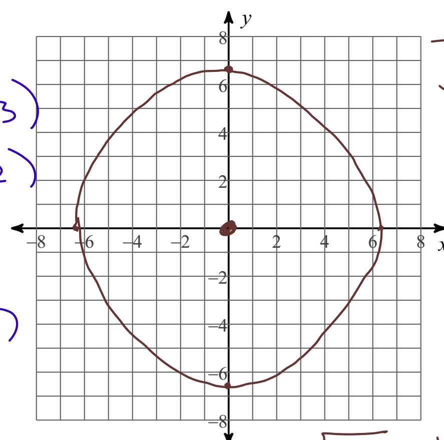
$x^2 + 49y^2 - 294y \underline{+441} = -392 + 441$

$x^2 + 49(y^2 - 6y \underline{+9}) =$

$\frac{x^2}{49} + \frac{49(y-3)^2}{49} = \frac{49}{49}$

$\boxed{\frac{x^2}{49} + (y-3)^2 = 1}$

9) $0 = 360 - 8y^2 - 9x^2$



$\frac{9x^2}{360} + \frac{8y^2}{360} = \frac{360}{360}$

$\boxed{\frac{x^2}{40} + \frac{y^2}{45} = 1}$

c $(0, 0)$

a $\sqrt{45}$ b $\sqrt{40}$

~6.7 ~6.3

v $(0, 3\sqrt{5})$ $(0, -3\sqrt{5})$

Co-vert. $(\pm 2\sqrt{10}, 0)$

$a^2 - b^2 = 45 - 40 = 5 = c^2$

$c = \sqrt{5}$ Foci $(0, \pm\sqrt{5})$

$e = \frac{c}{a} = \frac{\sqrt{5}}{3\sqrt{5}} = 1/3$

Use the information provided to write the standard form equation of each ellipse.

10) Foci: $\left(-10 + 3\sqrt{17}, 9\right), \left(-10 - 3\sqrt{17}, 9\right)$

Point on the ellipse: $\left(\dfrac{\sqrt{507} - 20}{2}, 7\right)$

$$4b^4 + 89b^2 - 2448 = 0$$

$$4b^4 + 153b^2 - 64b^2 - 2448$$

$$b^2(4b^2 + 153) - 16(4b^2 + 153) = 0$$

$$(4b^2 + 153)(b^2 - 16) = 0 \quad \text{so } \boxed{b^2 = 16}$$