PreCalc 9-1 to 9-3 PRACTICE

Name:____________________________

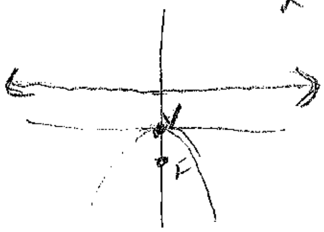
$(y-k)^2 = 4p(x-h)$

1.) Find the equation of the parabola described.

a. Focus (0, -1); Directrix the line y = 1

Equation: $(x-0)^2 = -4(y-0)$

$x^2 = -4y$



D: $y=1$

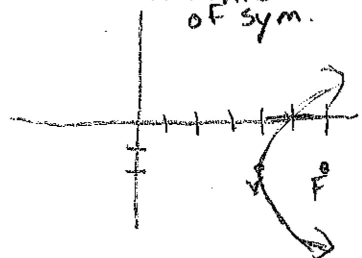
$|p|=1$

• $p=-1$ b/c graph opens Down

b. Vertex at (4, -2); Focus at (6, -2)

Equation: $(y+2)^2 = 8(x-4)$

• horizontal Axis of sym.



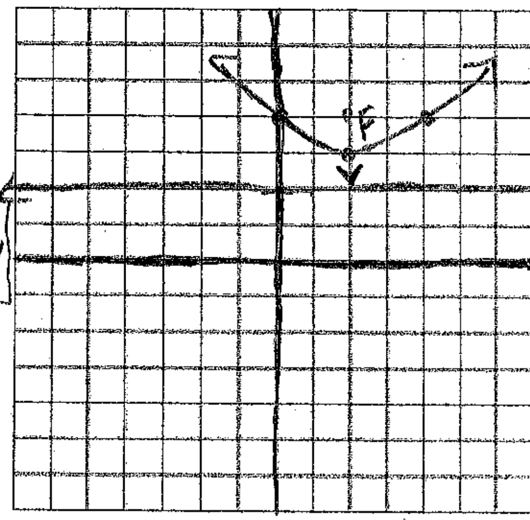
• opens right, so $p>0$

$\hookrightarrow p=2$ (Distance b/w vertex & Focus)

2.) Rewrite the equation in the form $y = a(x-h)^2 + k$. Find the vertex, focus, and directrix of the parabola. Then graph the equation. $(x-2)^2 = 4(y-3)$

Equation: $y = \frac{1}{4}(x-2)^2 + 3$

Vertex: $(2,3)$ Focus: $(2,4)$ Directrix: $y=2$



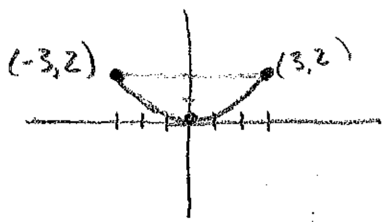
D: $y=2$

• Equation: $\frac{(x-2)^2}{4} = \frac{\cancel{4}(y-3)}{\cancel{4}} \rightarrow \boxed{\frac{1}{4}(x-2)^2 + 3 = y}$

• $4p = 4 \rightarrow p=1$ since $p>0$, the graph opens up.

• $LR = |4| = 4$, so 2 pts that form the LR are $\boxed{(0,4) \text{ \& } (4,4)}$

3.) A cable TV receiving dish is in the shape of a paraboloid of revolution. Find the location of the receiver, which is placed at the focus, if the dish is 6 feet across at its opening and 2 feet deep. Show work!



location of receiver is $\frac{9}{8}$ ft from the base.

V (0, 0)

• Sub (3,2) For x & y, AND (0,0) For (h,k) to Solve For p.

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

$(3-0)^2 = 4p(2-0)$

$\frac{9}{8} = \frac{8p}{8}$ $p = \frac{9}{8}$ ft

4.) Find an equation for an ellipse with foci at (0, ±2) and length of the major axis is 8.

Equation: $\frac{x^2}{(2\sqrt{3})^2} + \frac{y^2}{4^2} = 1$ or $\frac{x^2}{12} + \frac{y^2}{16} = 1$

• $2a = 8 \rightarrow a = 4$

• Foci @ $(0, \pm 2)$ so $c = 2$

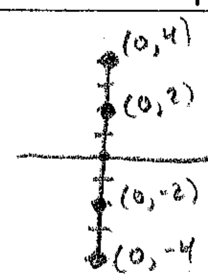
• $a^2 = b^2 + c^2$

$4^2 = b^2 + 2^2$

$12 = b^2 \rightarrow b = 2\sqrt{3}$

Ctr (0,0)

• length of major axis the Distance b/w the vertices.



5.) Find the center, foci and vertices of the ellipse. Then graph the ellipse. $x^2+9y^2+6x-18y+9=0$

$a=3$

$b=1$

$\cdot\ a^2=b^2+c^2$

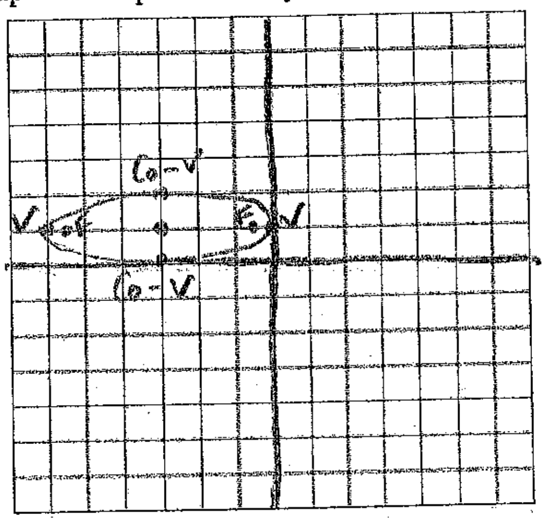
$3^2=1^2+c^2$

$8=c^2$

Center: $(-3,1)$

Foci: $\boxed{(-3-2\sqrt{2},1)+(-3+2\sqrt{2},1)}$ $2\sqrt{2}=c$

Vertices: $(-6,1)+(0,1)$



$\cdot\ x^2+6x+\square+9y^2-18y=-9$

$x^2+6x+9+9(y^2-2y+1)=-9+9+9(1)$

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

6.) Find an equation for an ellipse with center at (-3, 1), vertex at (-3, 3) and focus at (-3, 0).

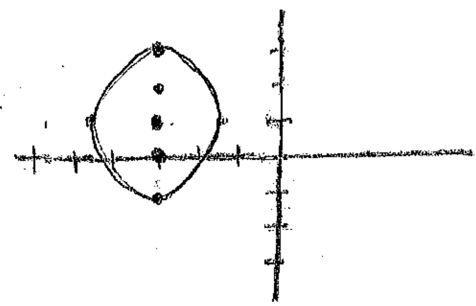
Equation: $\dfrac{(x+3)^2}{3}+\dfrac{(y-1)^2}{4}=1$

$\cdot\ a=2,\ c=1$

$a^2=b^2+c^2$

$2^2=b^2+1^2$

$3=b^2 \rightarrow b=\sqrt{3}$

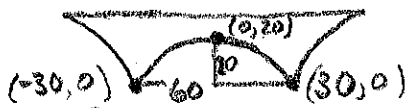


7.) A bridge is built in the shape of a parabolic arch. The bridge has a span of 60 feet and a maximum height of 20 feet. Find the height of the arch at distances of 5, 10, and 20 feet from the center. Show work!

height at 5 ft: 19.44 Ft

height at 10 ft: 17.78 Ft

height at 20 ft: 11.11 Ft



① $(x-h)^2=4p(y-k)$

$(30-0)^2=4p(0-20)$

$\dfrac{900}{-80}=\dfrac{-80p}{-80}$

$-11.25=p$

② $(x-0)^2=4(-11.25)(y-20)$

$\boxed{x^2=-45(y-20)}$

$\dfrac{(20)^2}{-45}=\dfrac{-45(y-20)}{-45}$

$\boxed{y=11.11\text{ Ft}}$

③ $\dfrac{(5)^2}{-45}=\dfrac{-45(y-20)}{-45} \rightarrow \boxed{19.44\text{ Ft}}$

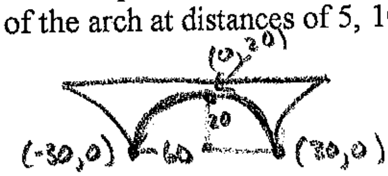
$\dfrac{(10)^2}{-45}=\dfrac{-45(y-20)}{-45} \rightarrow \boxed{17.78\text{ Ft}}$

8.) A bridge is built in the shape of a semi-elliptical arch. The bridge has a span of 60 feet and a maximum height of 20 feet. Find the height of the arch at distances of 5, 10, and 20 feet from the center. Show work!

height at 5 ft: 19.72 Ft

height at 10 ft: 18.86 Ft

height at 20 ft: 14.91 Ft



$\cdot$ Sub in 5, 10, + 20 For X and solve for y.

$a=30,\ b=20$

Ctr $(h,k) \rightarrow (0,0)$

$\cdot$ Horizontal Major Axis

$\dfrac{(x-h)^2}{a^2}+\dfrac{(y-k)^2}{b^2}=1$

$\boxed{\dfrac{x^2}{30^2}+\dfrac{y^2}{20^2}=1}$

$\cdot\ \dfrac{(5)^2}{30^2}+\dfrac{y^2}{20^2}=1 \rightarrow \dfrac{y^2}{400}=\dfrac{900}{900}-\dfrac{25}{900} \rightarrow \dfrac{y^2}{400}\times\dfrac{875}{900} \rightarrow \boxed{y=19.72}$

$\cdot\ \dfrac{(10)^2}{30^2}+\dfrac{y^2}{20^2}=1 \rightarrow \boxed{y=18.86}$ $\cdot\ \dfrac{(20)^2}{30^2}+\dfrac{y^2}{20^2}=1 \rightarrow \boxed{y=14.91}$