

2. Second Degree Equation	Values for A, B, C, D, E, F	Evaluate $B^2 - 4AC$ Indicate if $>$, $<$ or $= 0$	Type of Conic section	Factored Form (if possible)
$x^2 + y^2 = 4$	$A=1, B=0, C=1$ $D=0, E=0, F=-4$	$-4 < 0$	Circle	cannot be factored
$x^2 - y^2 = 1$	$A=1, B=0, C=-1$ $D=0, E=0, F=-1$	$4 > 0$	Hyperbola	$(x-y)(x+y) = 1$
$x^2 + y = 4$	$A=1, B=0, C=0$ $D=0, E=1, F=-4$	$0 = 0$	Parabola	Cannot be factored
$x^2 - 9y^2 = 1$	$A=1, B=0, C=-9$ $D=0, E=0, F=-1$	$36 > 0$	Hyperbola	$(x-3y)(x+3y) = 1$
$\frac{x^2}{9} + y^2 = 1$	$A=\frac{1}{9}, B=0, C=1$ $D=0, E=0, F=-1$	$-\frac{4}{9} < 0$	Ellipse	Cannot be factored
$y - x^2 = 1$	$A=-1, B=0, C=0$ $D=0, E=1, F=-1$	$0 = 0$	Parabola	Cannot be factored
$9x^2 - 4y^2 = 36$	$A=9, B=0, C=-4$ $D=0, E=0, F=-36$	$144 > 0$	Hyperbola	$(3x-2y)(3x+2y) = 36$

- 3
- Hyperbola
 - It is greater than 0.
 - Hyperbola.
 - The difference of two squares.

Guided Practice

Equation: $y^2 - x^2 = 1$

Step 1.

1. The graph of $y^2 - x^2 = 1$ is a hyperbola
2. It can be factored as $(y-x)(y+x) = 1$
3. The graphs of $(y-x)=0$ and $(y+x)=0$ are both straight lines.

4.

(a) line 1: $y = x$

line 2: $y = -x$

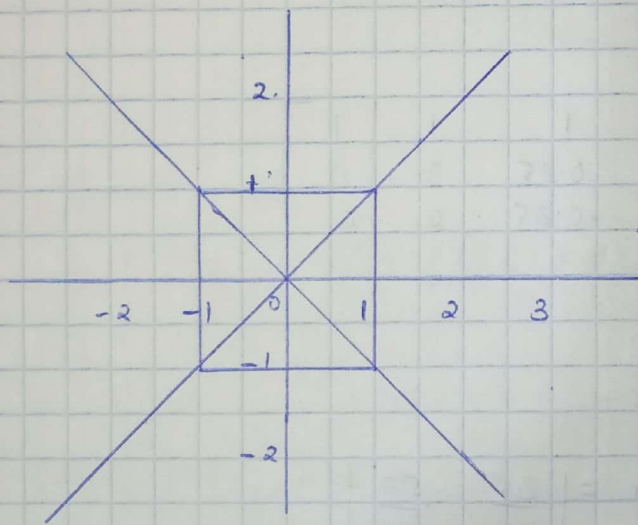
(b) $\frac{y^2}{1} - \frac{x^2}{1} = 1$

Corner points = $(\pm 1, \pm 1)$

$= (1, 1), (1, -1), (-1, 1), (-1, -1)$

Step 2

4.



Step 3

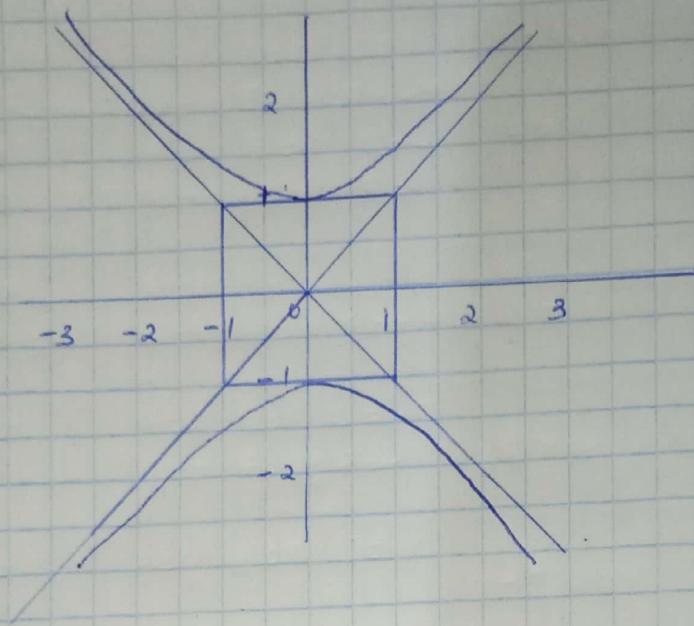
x-intercepts: $0 - x^2 = 1 \Rightarrow x^2 = -1$

= None

y-intercepts: $y^2 - 0 = 1 \Rightarrow y^2 = 1, y = 1, -1$

$= (0, -1), (0, 1)$

$(0, -1)$ and $(0, 1)$ are the vertices of the hyperbola.



Additional Problems

(a) $x^2 - y^2 = 1$

Left-side factored: $(x-y)(x+y) = 1$

Equation of Asymptotes:

$x - y = 0$ and $x + y = 0$

$x = y$ and $x = -y$

$y = x$ and $y = -x$

Corner points: $(\pm 1, \pm 1)$

$= (-1, 1), (1, 1), (1, -1), (-1, -1)$

Intercepts:

x-intercepts: $x^2 - 0 = 1$

$x^2 = 1$

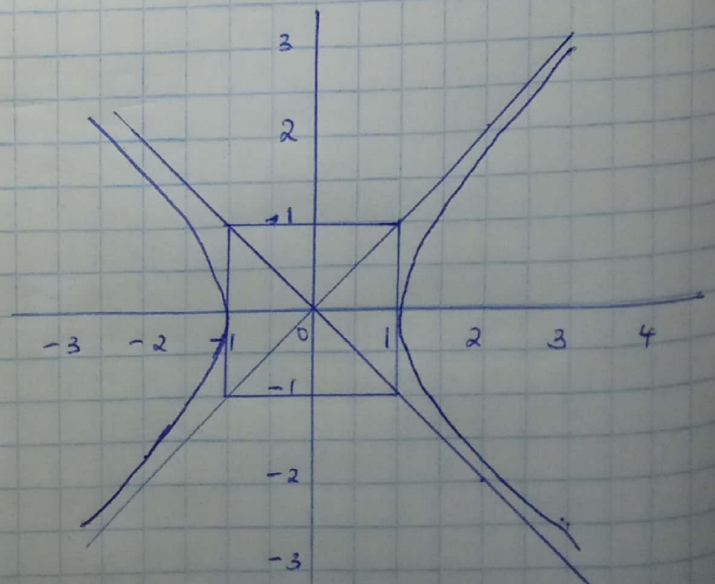
$x = -1, 1$

$= (-1, 0), (1, 0)$

y-intercepts: $0 - y^2 = 1$

$y^2 = -1$

None



b. $y^2 - \frac{x^2}{4} = 1$

Left-side factored: $(y - \frac{1}{2}x)(y + \frac{1}{2}x) = 1$

Equation of Asymptotes:

$y - \frac{1}{2}x = 0$ and $y + \frac{1}{2}x = 0$

$y = \frac{1}{2}x$ and $y = -\frac{1}{2}x$

Corner points: $(\pm 2, \pm 1)$

$= (2, 1), (2, -1), (-2, 1), (-2, -1)$

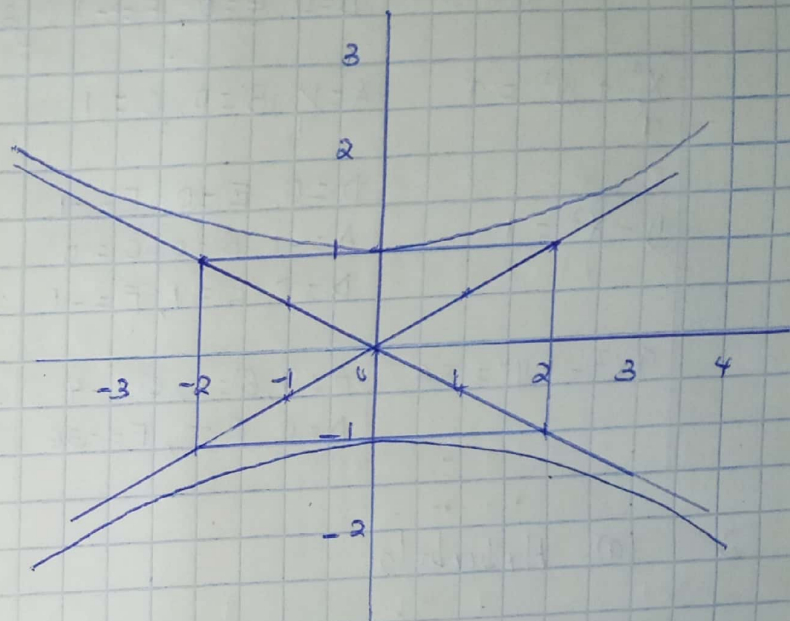
Intercepts:

x-intercepts: None

y-intercepts: $y^2 = 1$

$y = -1, 1$

$= (0, -1), (0, 1)$



c. $x^2 - \frac{y^2}{9} = 1$

Left-side factored: $(x - \frac{1}{3}y)(x + \frac{1}{3}y) = 1$

Equation of asymptotes

$x - \frac{1}{3}y = 0$ and $x + \frac{1}{3}y = 0$

$y = 3x$ and $y = -3x$

Corner points: $(\pm 1, \pm 3)$

$= (1, 3), (-1, 3), (1, -3), (-1, -3)$

Intercepts:

x-intercepts: $(1, 0), (-1, 0)$

y-intercepts: None

