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# VCE Mathematical Methods ½
## Functions & Relations I [2.1]
## Homework

### Homework Outline:

| | |
|---|---|
| **Compulsory Questions** | Pg 2 – Pg 21 |
| **Supplementary Questions** | Pg 22 – Pg 39 |

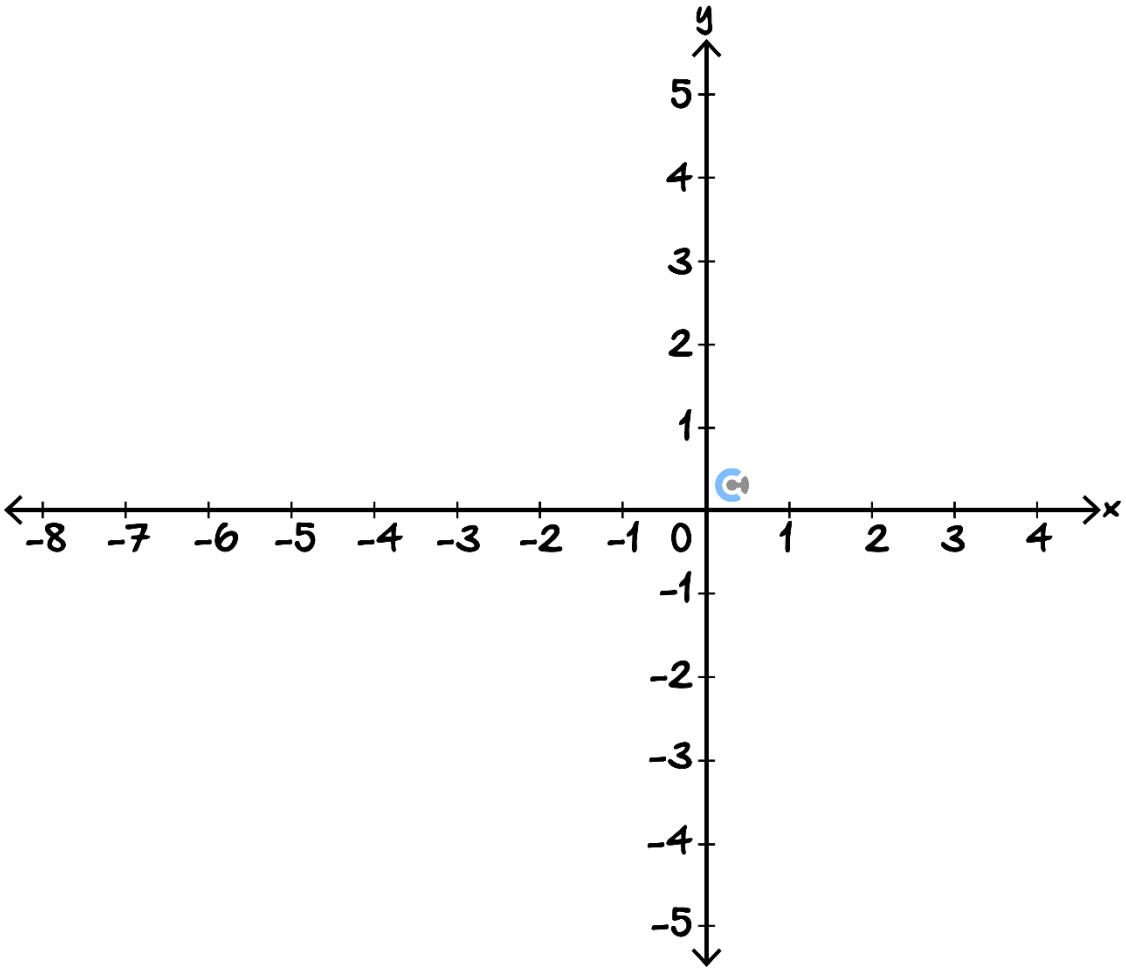
## Section A: Compulsory Questions

### Sub-Section [2.1.1]: Sketch and Find the Rule of Hyperbolas Functions

**Question 1**

Graph the following curve labelling all intercepts and asymptotes with their equations.

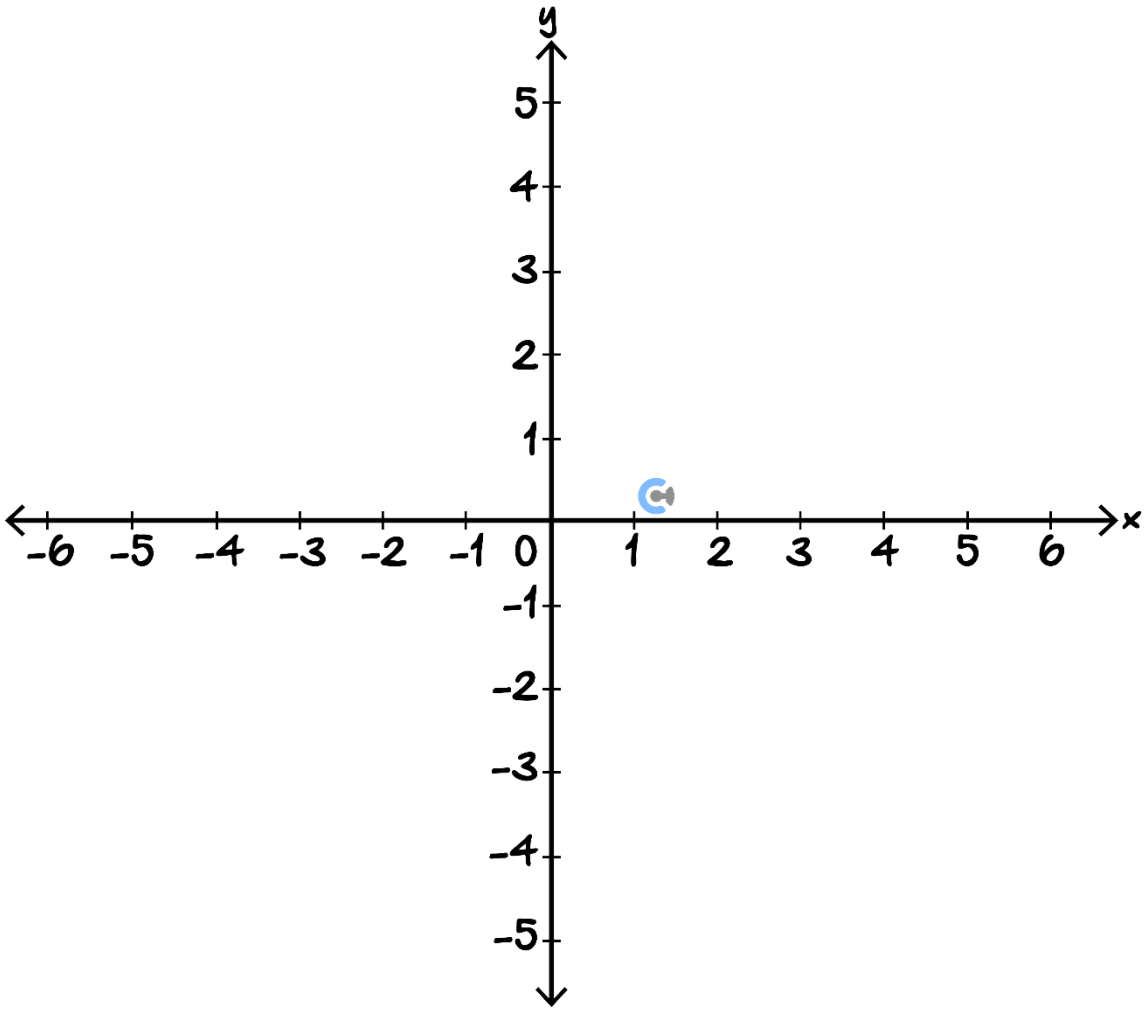
$$y = \frac{1}{x+3} - 1$$



**Question 2**

Graph the following curve labelling all intercepts and asymptotes with their equations.

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

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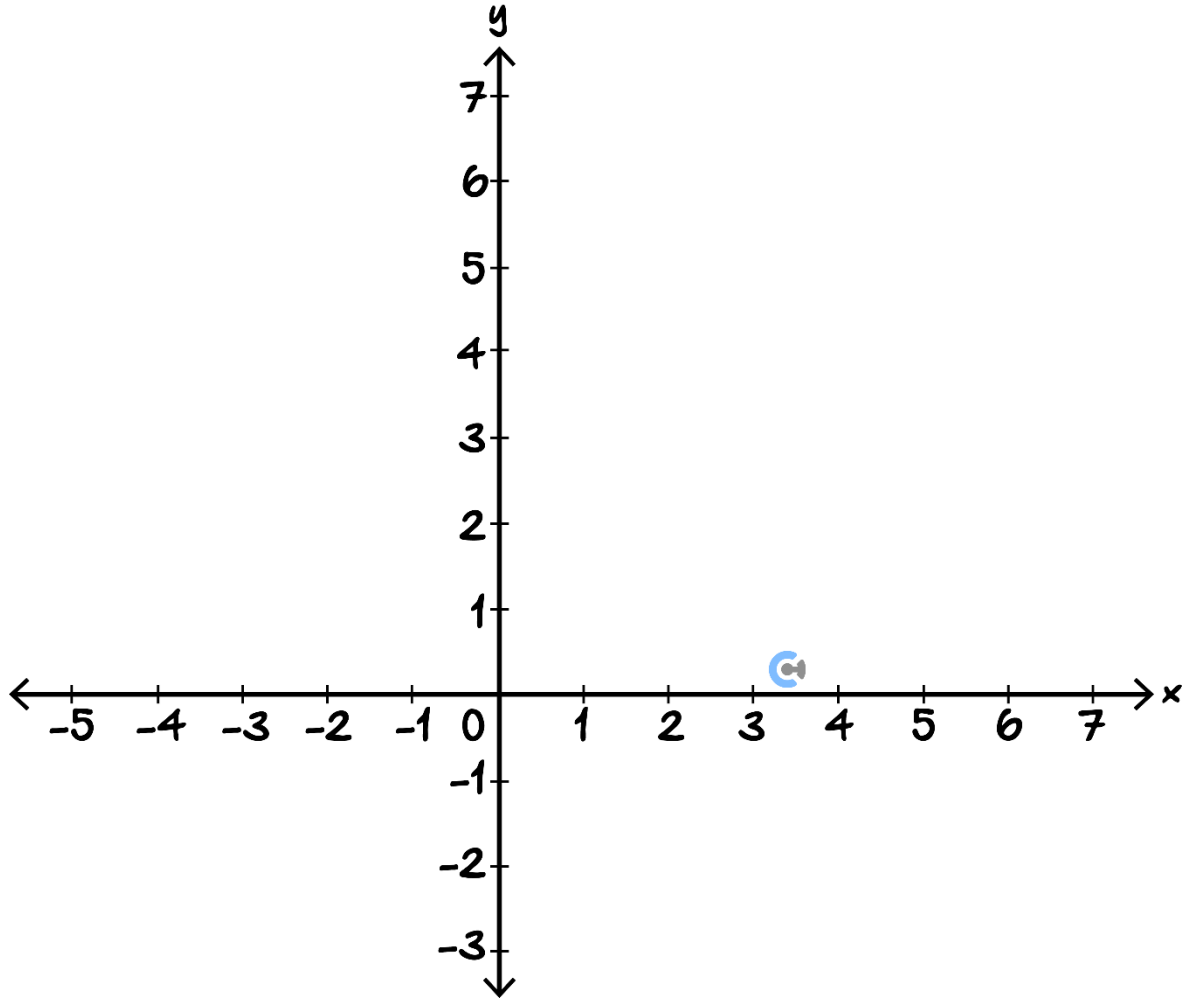
**Question 3**

Graph the following curve labelling all intercepts and asymptotes with their equations.

$$y = 2 - \frac{3}{4 - 3x}$$

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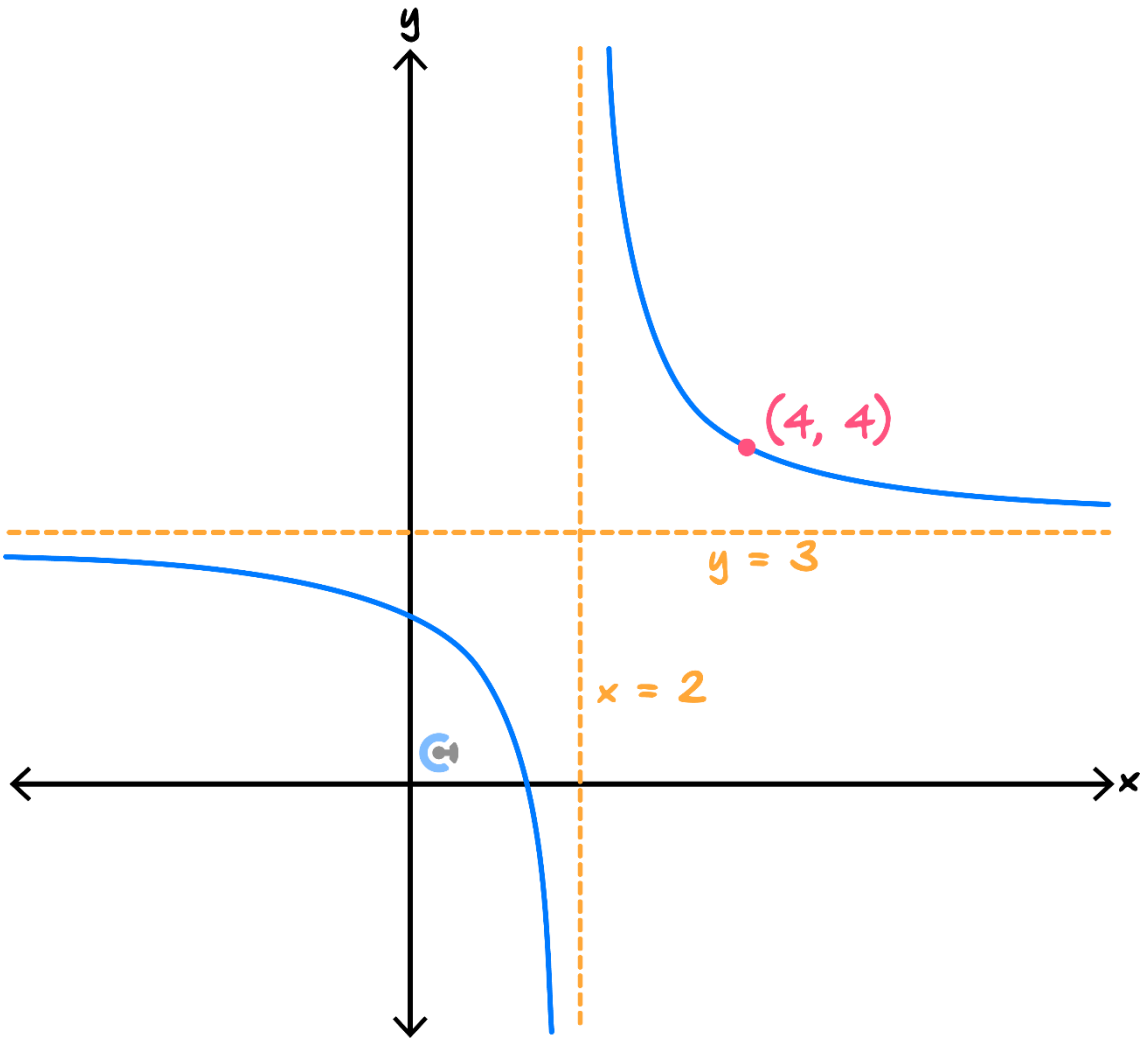
**Question 4**

Find the rule for the following graph, given it is of the form $y = \frac{a}{x-h} + k$.

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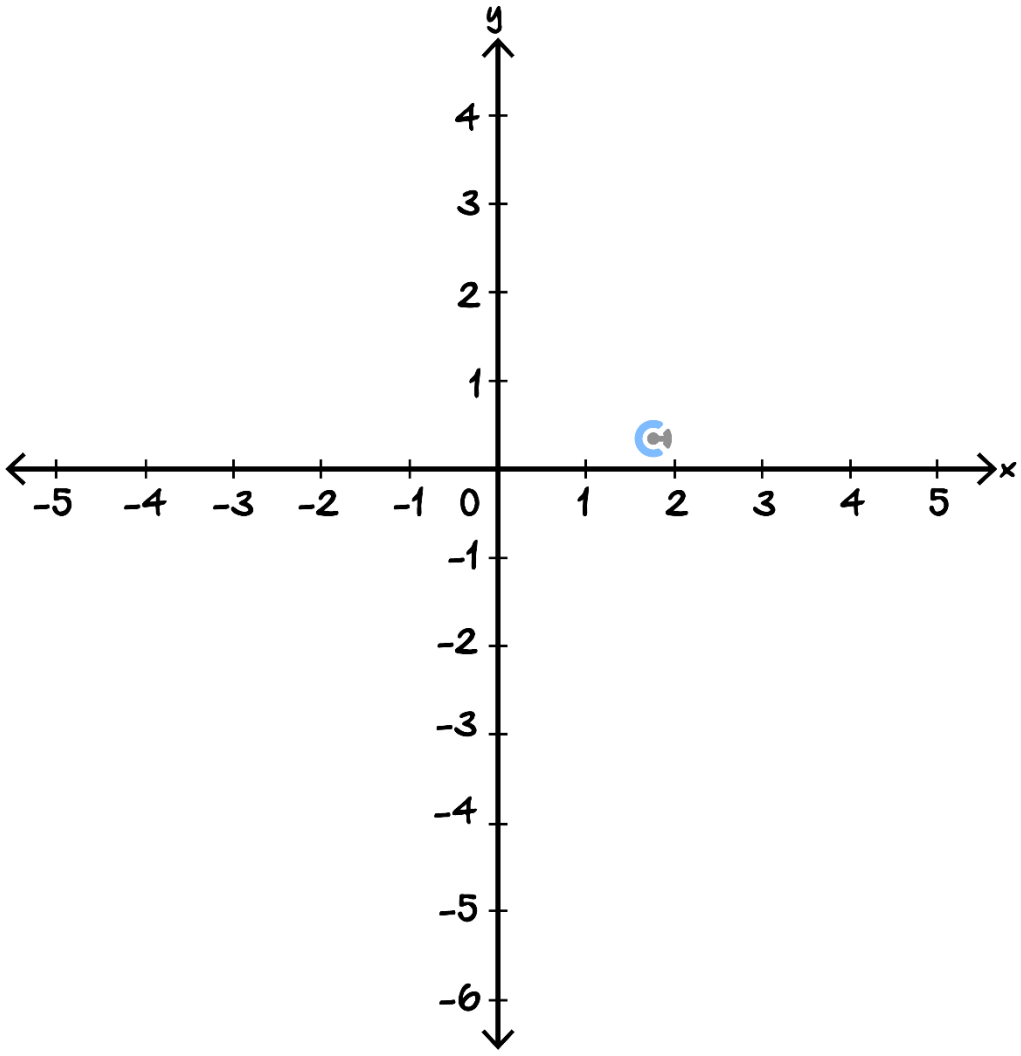
## Sub-Section [2.1.2]: Sketch and Find the Rule of Truncus Functions

**Question 5**

Graph the following curve labelling all intercepts and asymptotes with their equations.

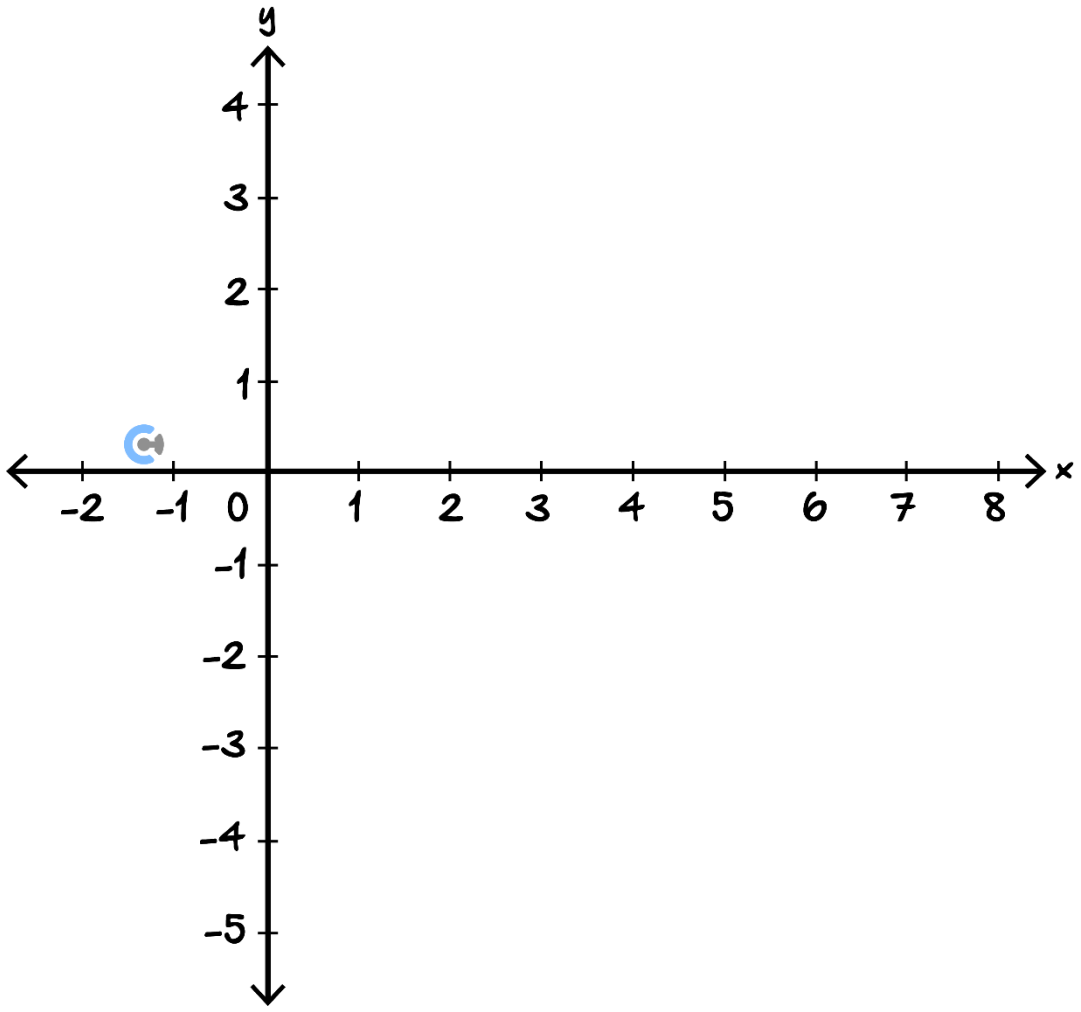
$$y = -\frac{1}{(x+1)^2} + 1$$



**Question 6**

Graph the following curve labelling all intercepts and asymptotes with their equations.

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

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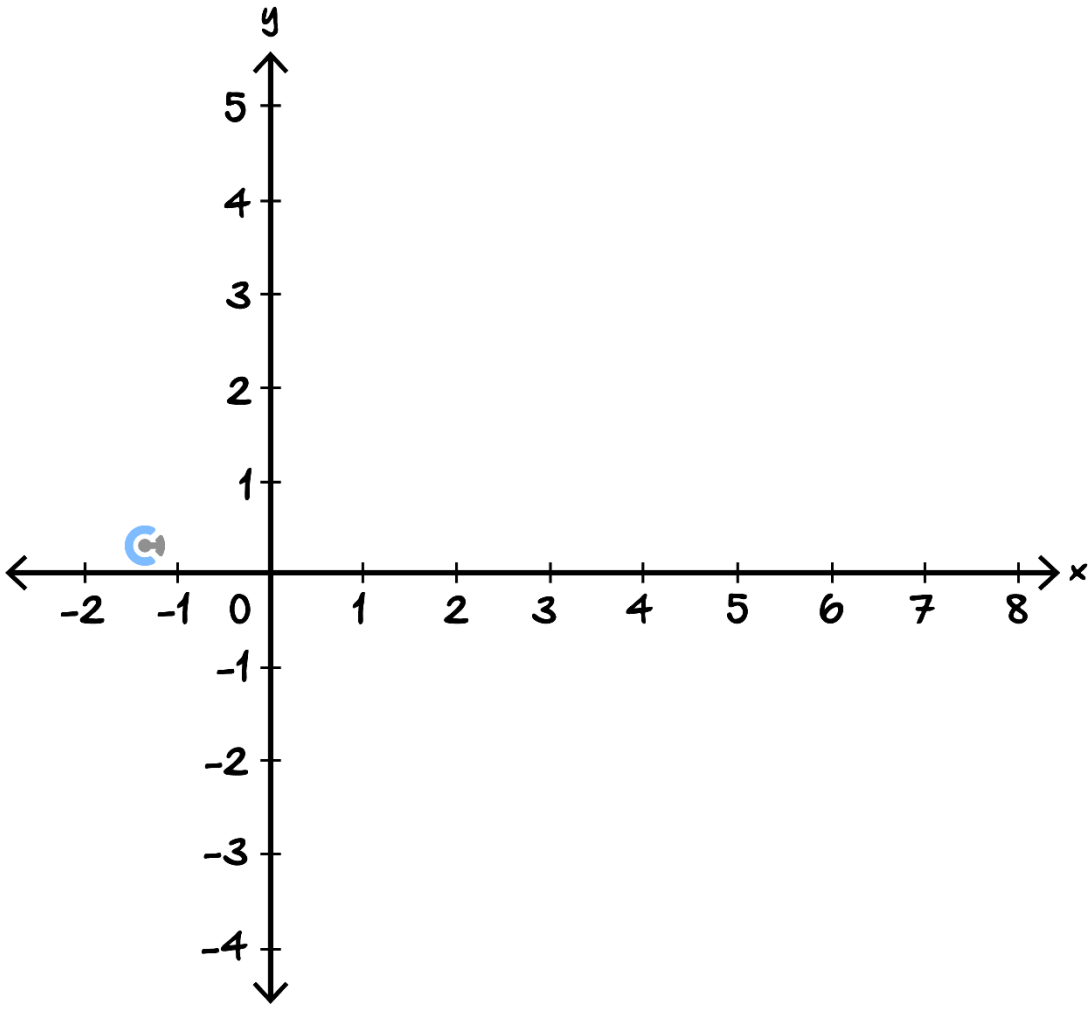
**Question 7**

Graph the following curve labelling all intercepts and asymptotes with their equations.

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

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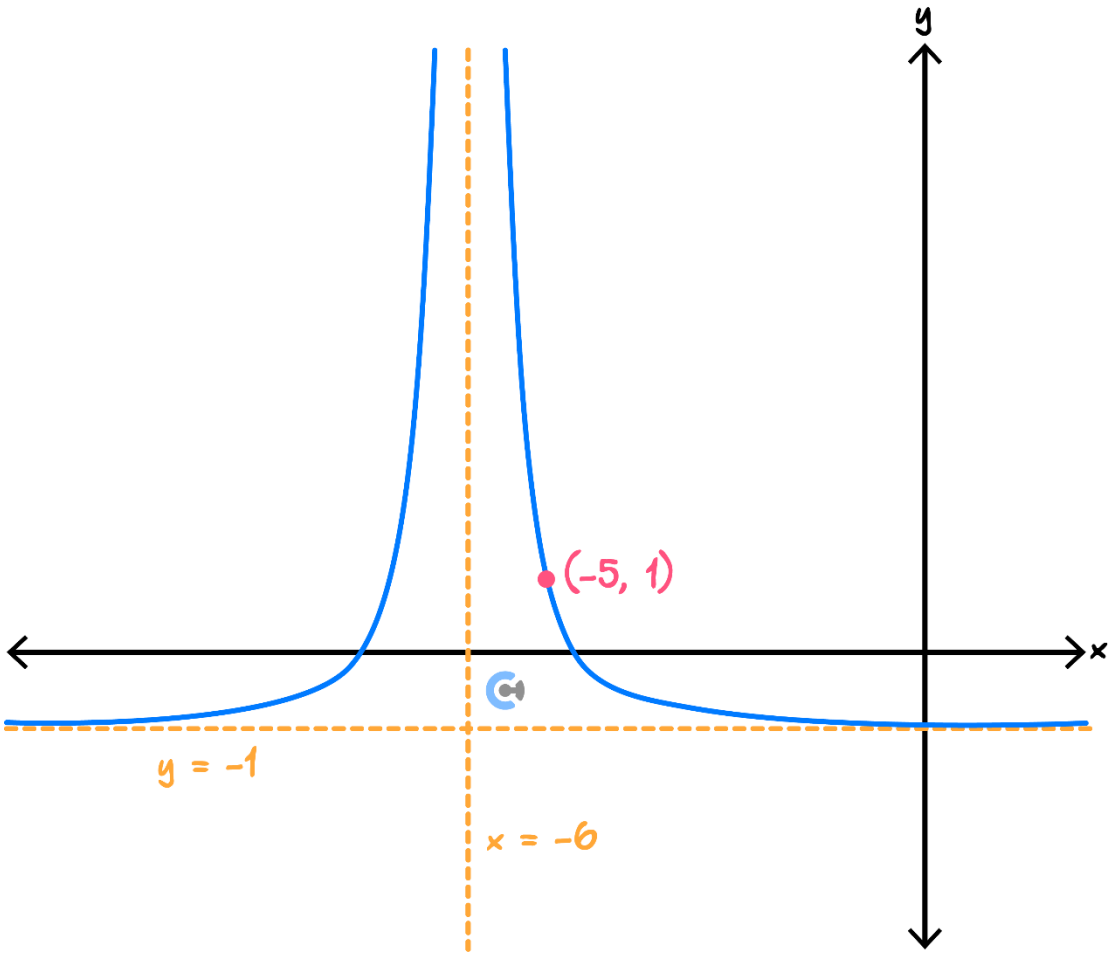
**Question 8**

Find the rule for the following graph, given it is of the form $y = \frac{a}{(x-h)^2} + k$.

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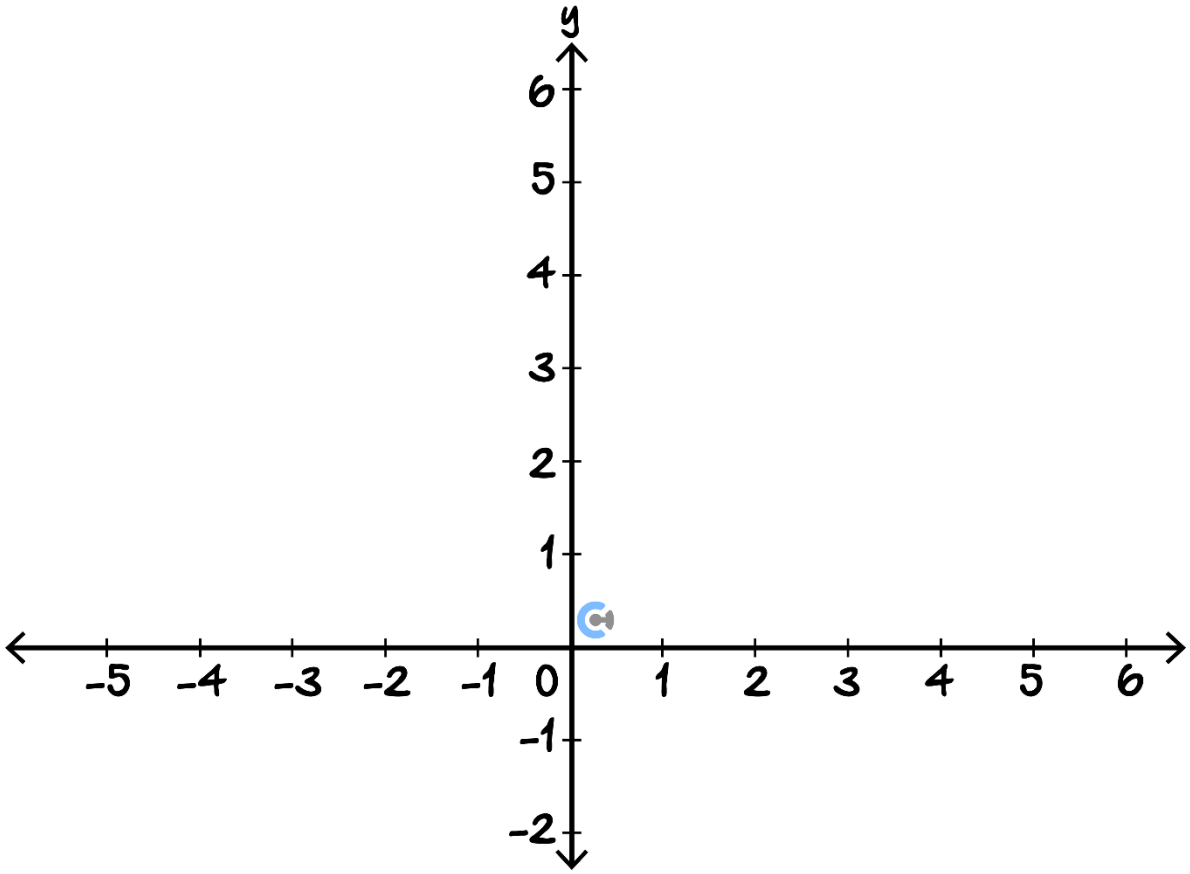
## Sub-Section [2.1.3]: Sketch and Find the Rule of Root Functions

**Question 9**

Graph the following curve labelling all intercepts and start points.

$$y = \sqrt{x + 5} + 1$$

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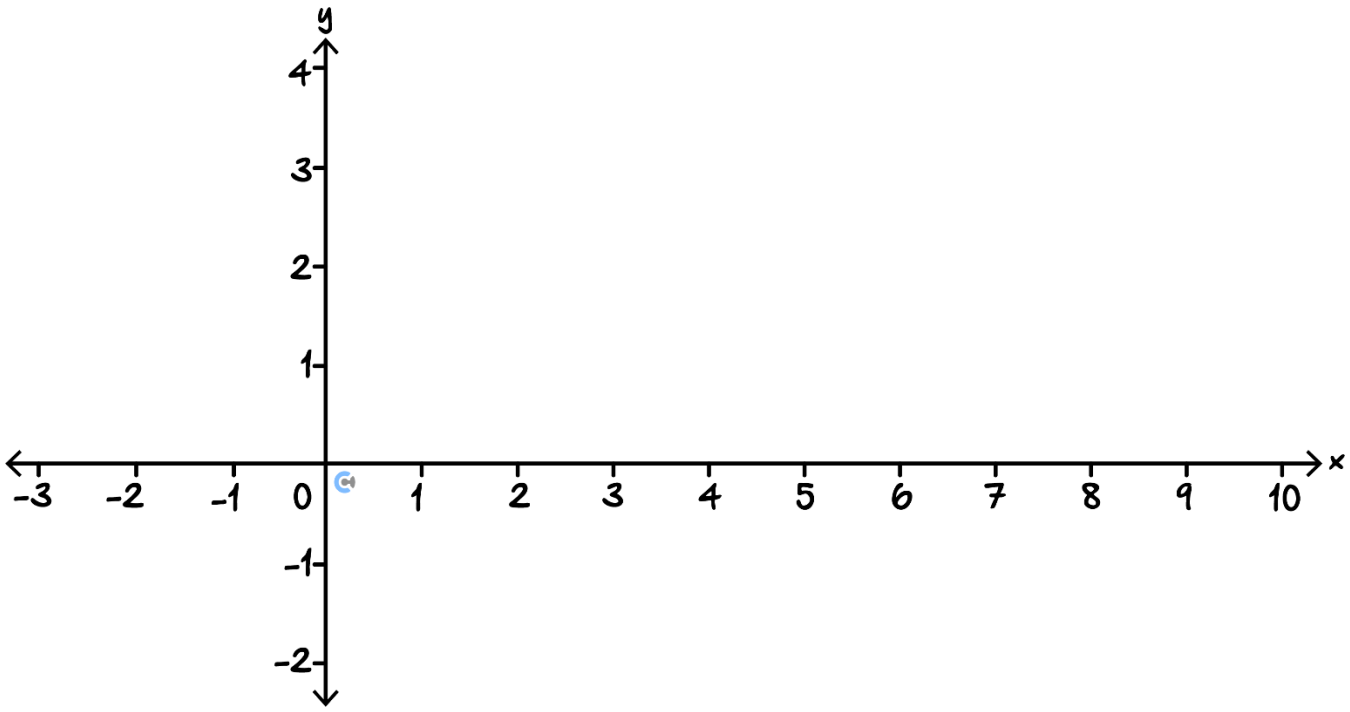
**Question 10**

Graph the following curve labelling all intercepts and start points.

$$y = -\sqrt{x+2} + 3$$

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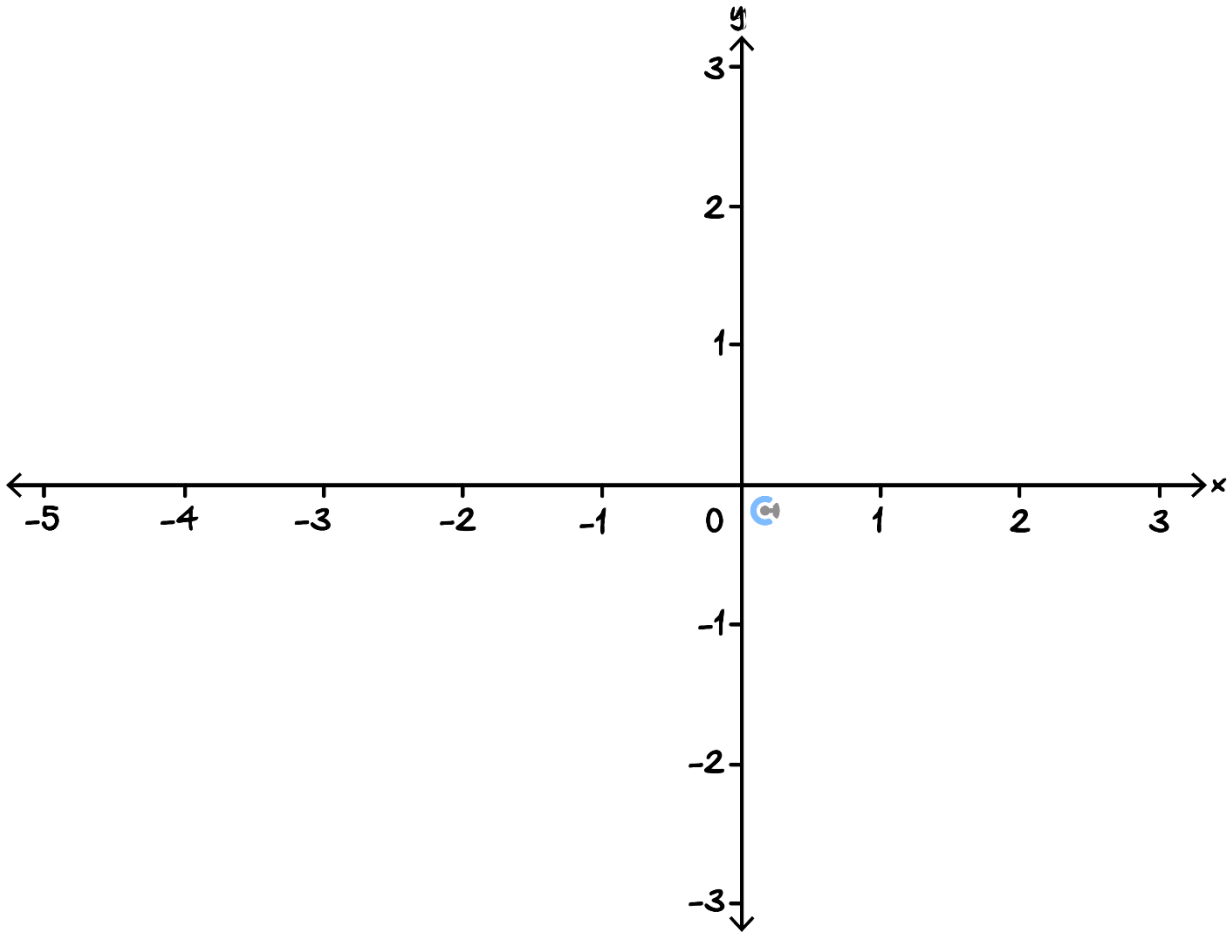
**Question 11**

Graph the following curve labelling all intercepts and start points.

$$y = 2 - \sqrt{3 - 2x}$$

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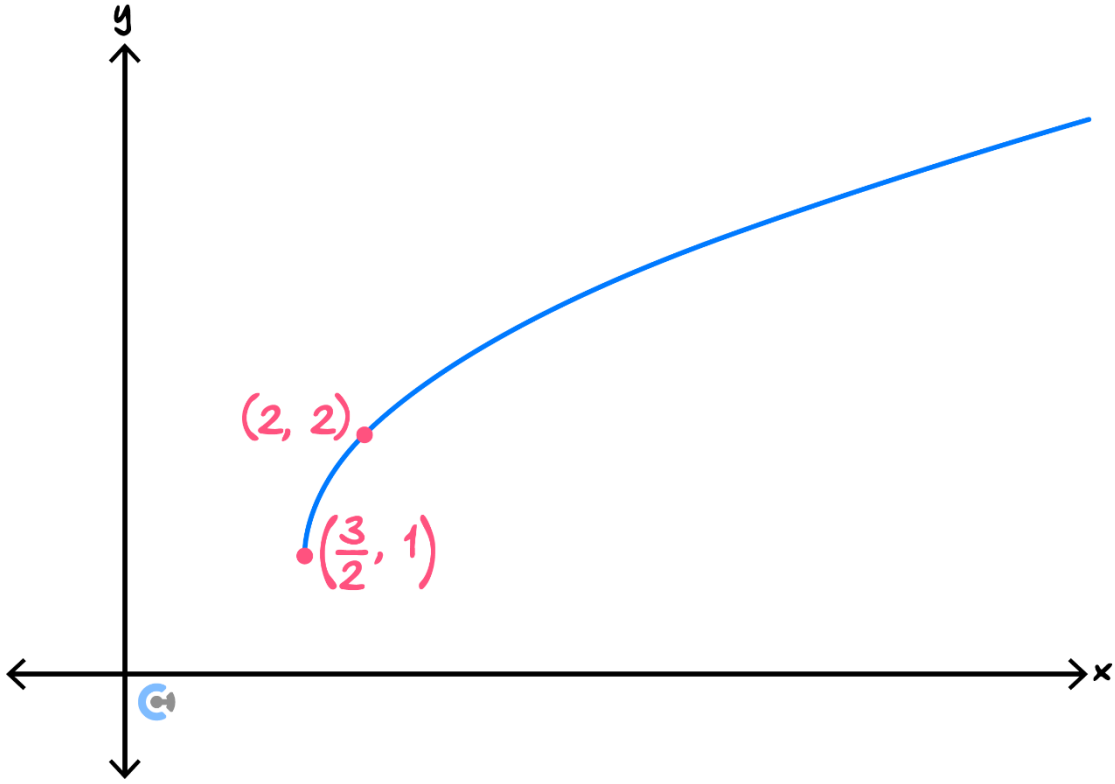
**Question 12**

Find the rule for the following graph, given it is of the form $y = \sqrt{a(x-h)} + k$.

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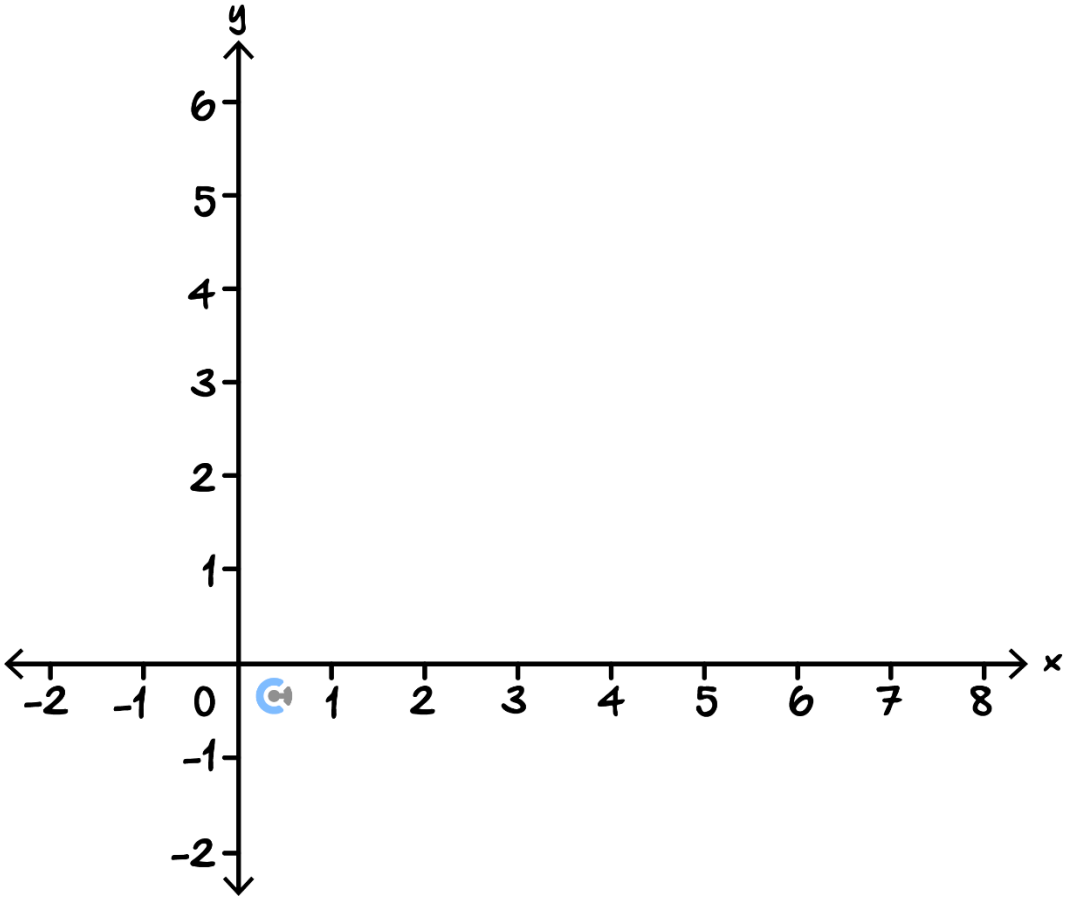
## Sub-Section [2.1.4]: Sketch and Find the Rule of Semicircles and Circles

**Question 13**

Graph the following circle, label all intercepts.

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

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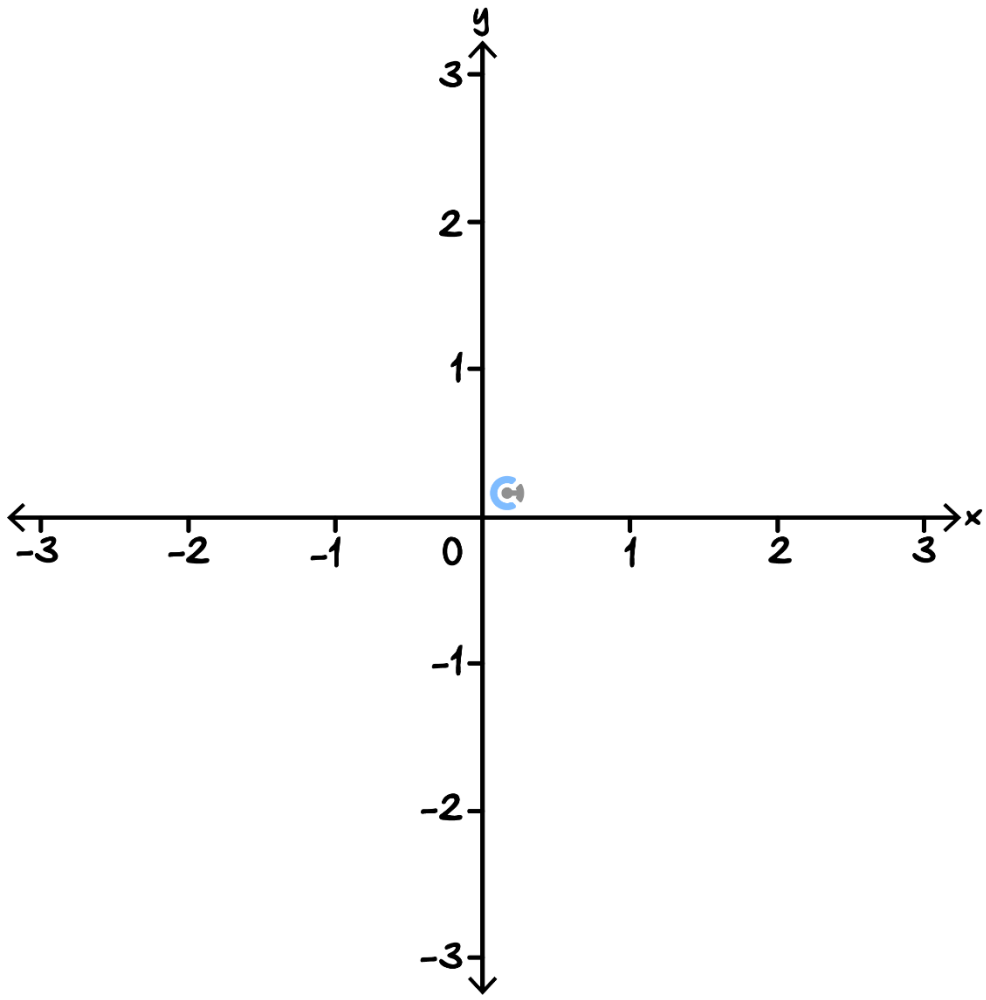
**Question 14**

Graph the following semi-circle, label all intercepts.

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

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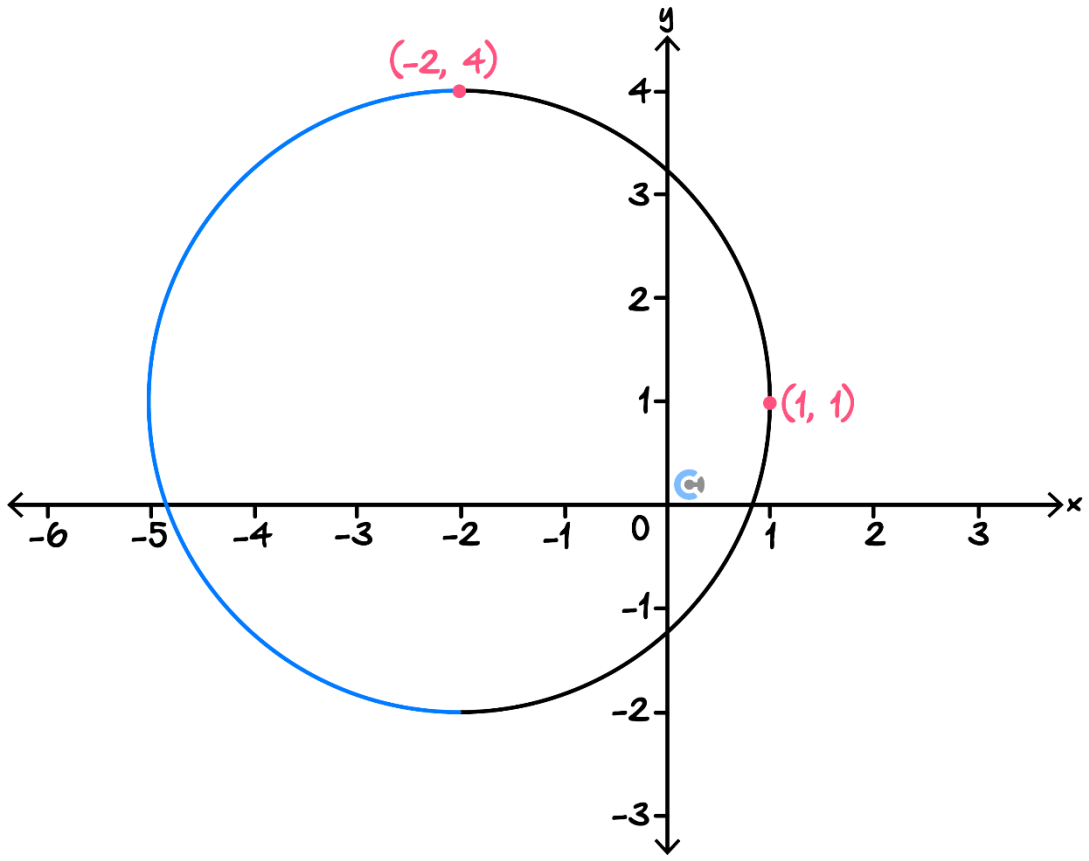
**Question 15**

Consider the circle with radius 3 shown on the graph below.



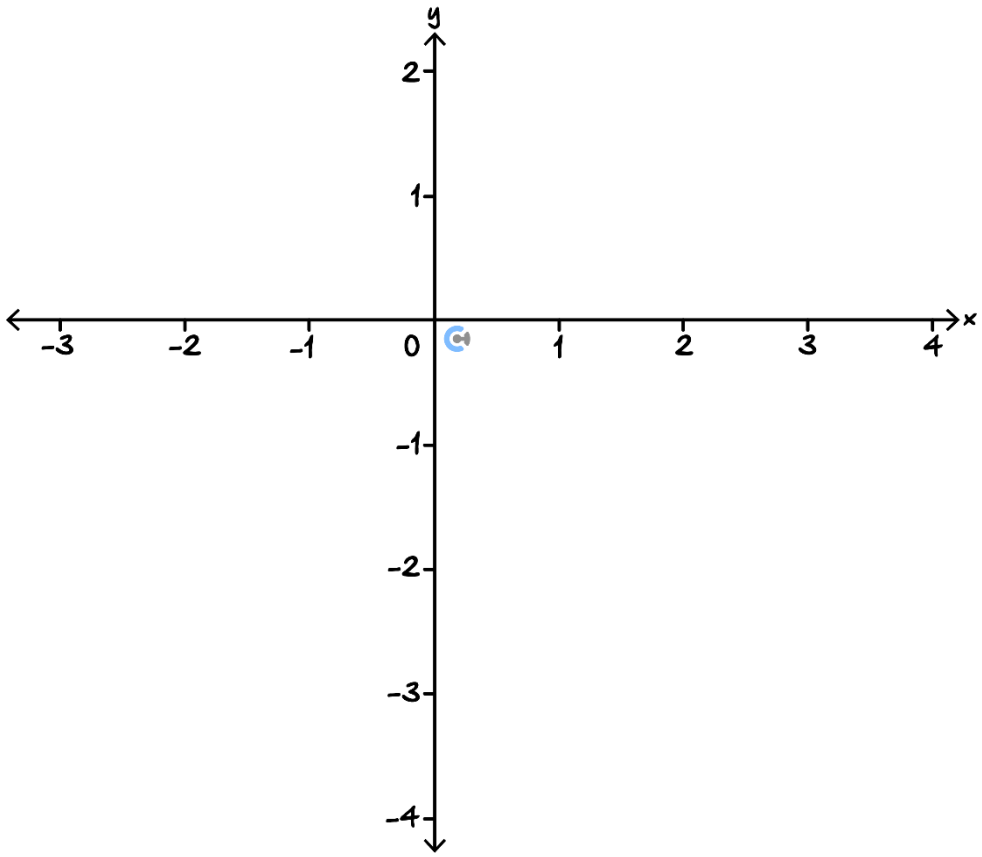

**a.** Determine the equation of the circle.

**b.** Hence, determine the equation of the semi-circle outlined in black.

**Question 16**

Graph the following circle, label all intercepts.

$$x^2 - 2x + y^2 + 2y - 2 = 0$$

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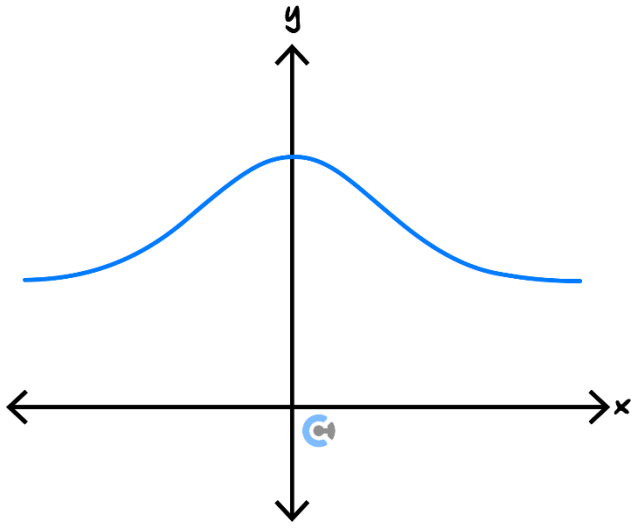
## Sub-Section [2.1.5]: Identify the Type of Relations and Identify Whether the Relation is a Function

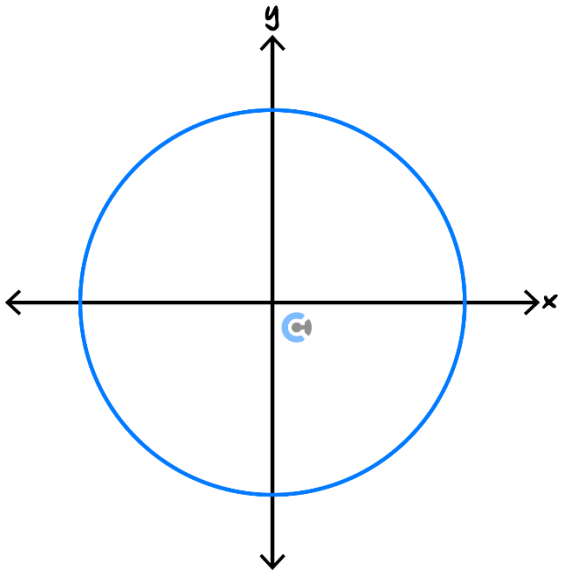
**Question 17**

For each of the following graphs, identify the type of relation depicted and whether the relation is a function.

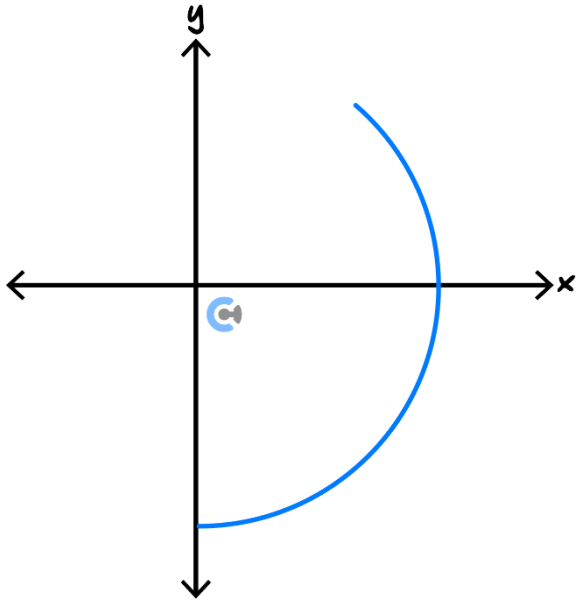
**a.**



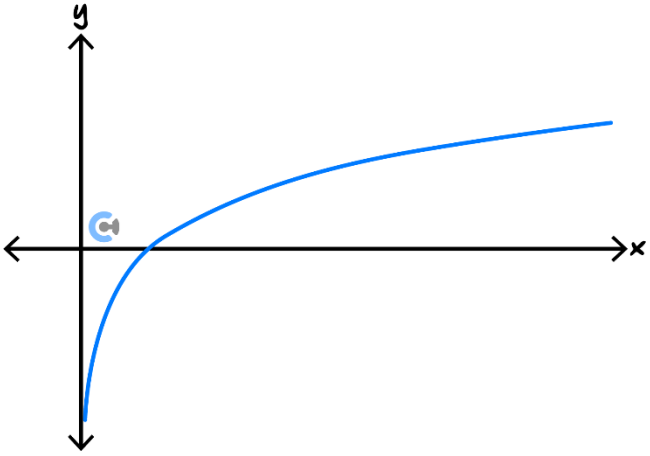

**b.**



**c.**




**d.**

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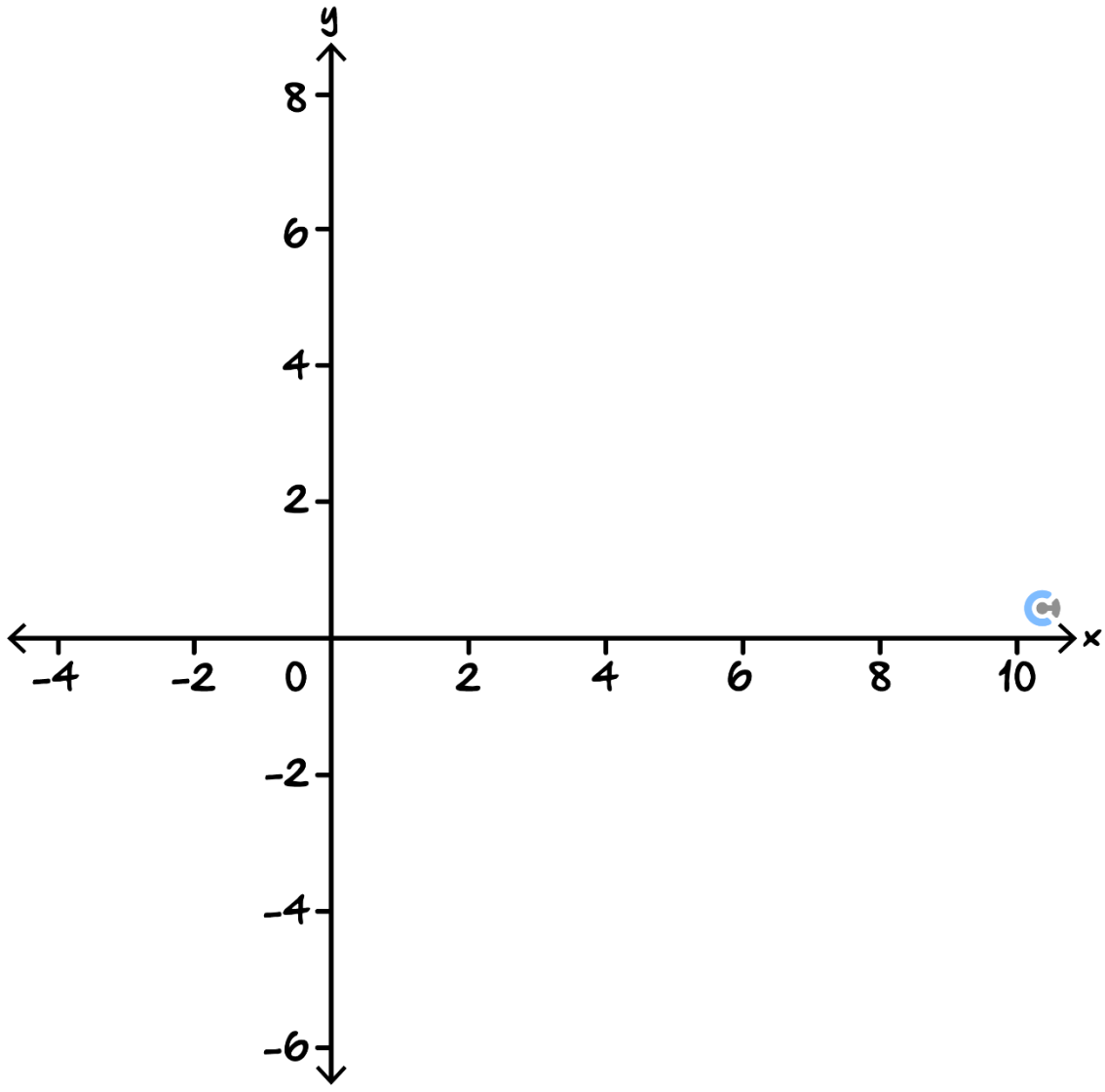
## Sub-Section: The 'Final Boss'

**Question 18**

Consider the hyperbola $y = \frac{4}{x-2} + 2$.

**a.** Sketch the graph of $y = \frac{4}{x-2} + 2$ on the axes below. Label all axes intercepts and asymptotes.



A circle with centre $(2, 2)$ is such that it hits each branch of the hyperbola exactly once.

**b.** Use the fact that the shortest distance between both branches of the hyperbola lies on the line $y = x$ in order to find the equation of the circle.

**c.** Sketch the circle from **part b.** on the same axes as **part a.** Label all axes intercepts and intersections with the hyperbola with coordinates.

**d.** Determine the function that describes the lower half of the circle from **part b**.

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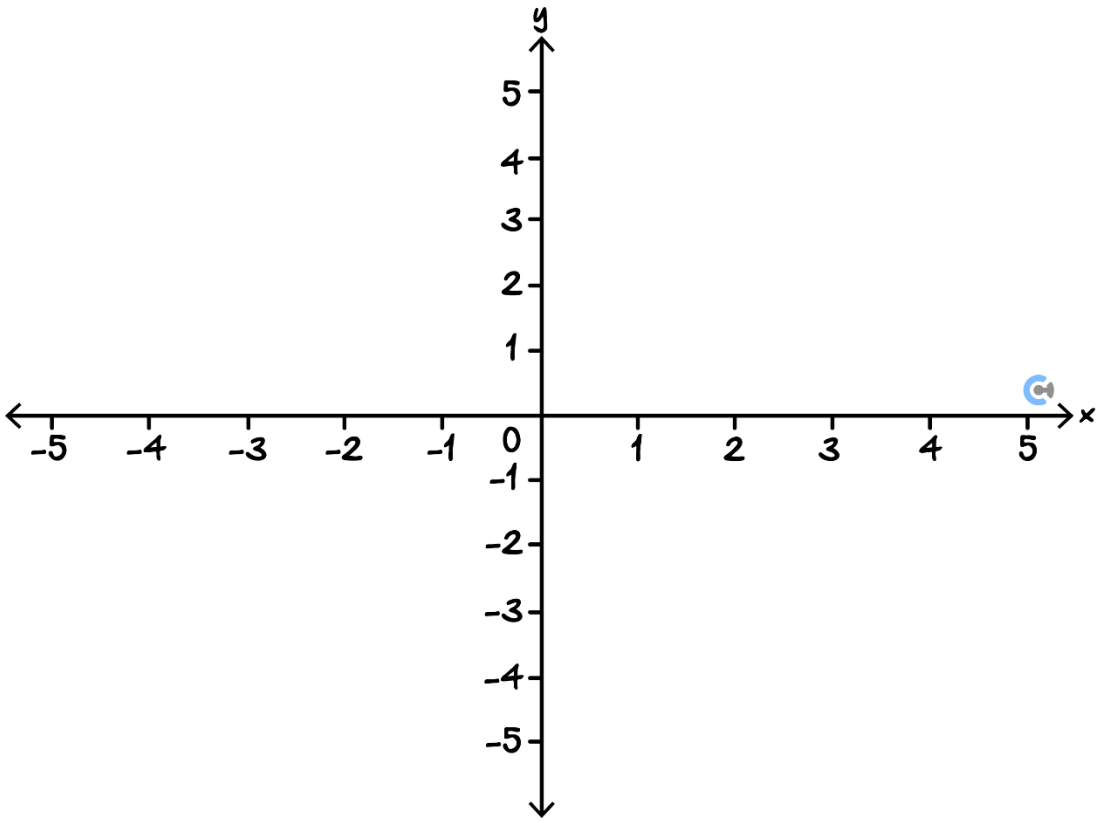
## Section B: Supplementary Questions

### Sub-Section [2.1.1]: Sketch and Find the Rule of Hyperbolas Functions

**Question 19**

Graph the following curve labelling all intercepts and asymptotes with their equations.

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

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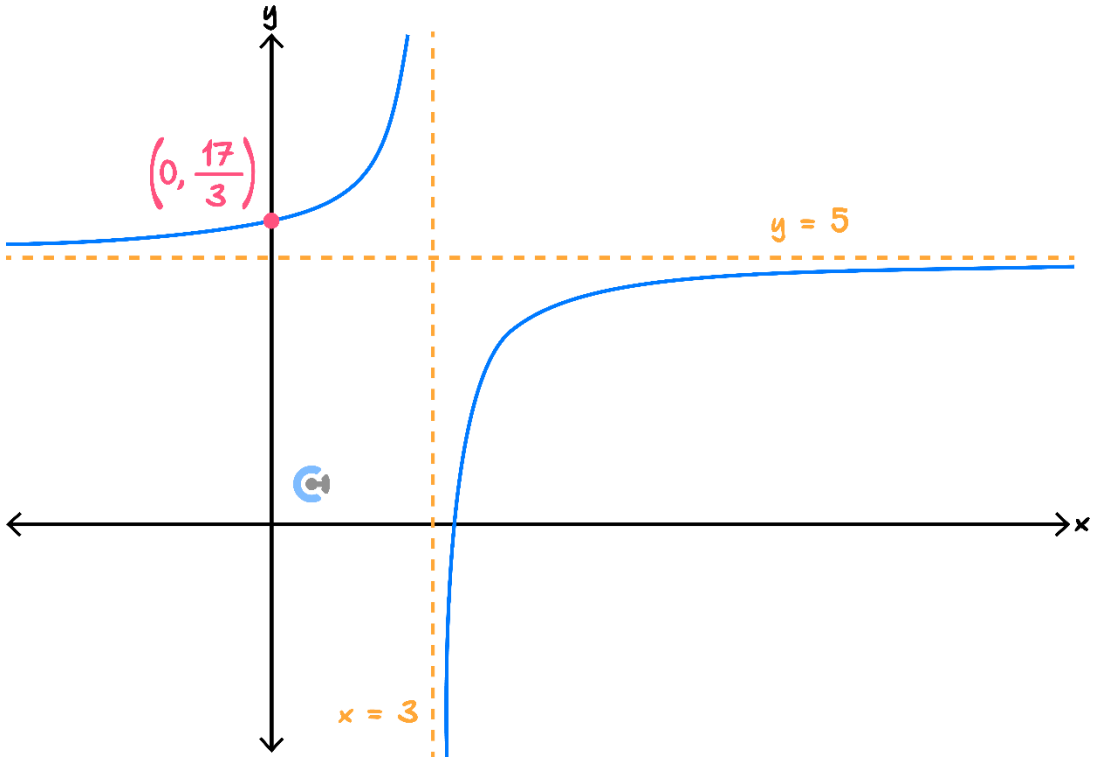
**Question 20**

Find the rule for the following graph, given it is of the form $y = \frac{a}{x-h} + k$.

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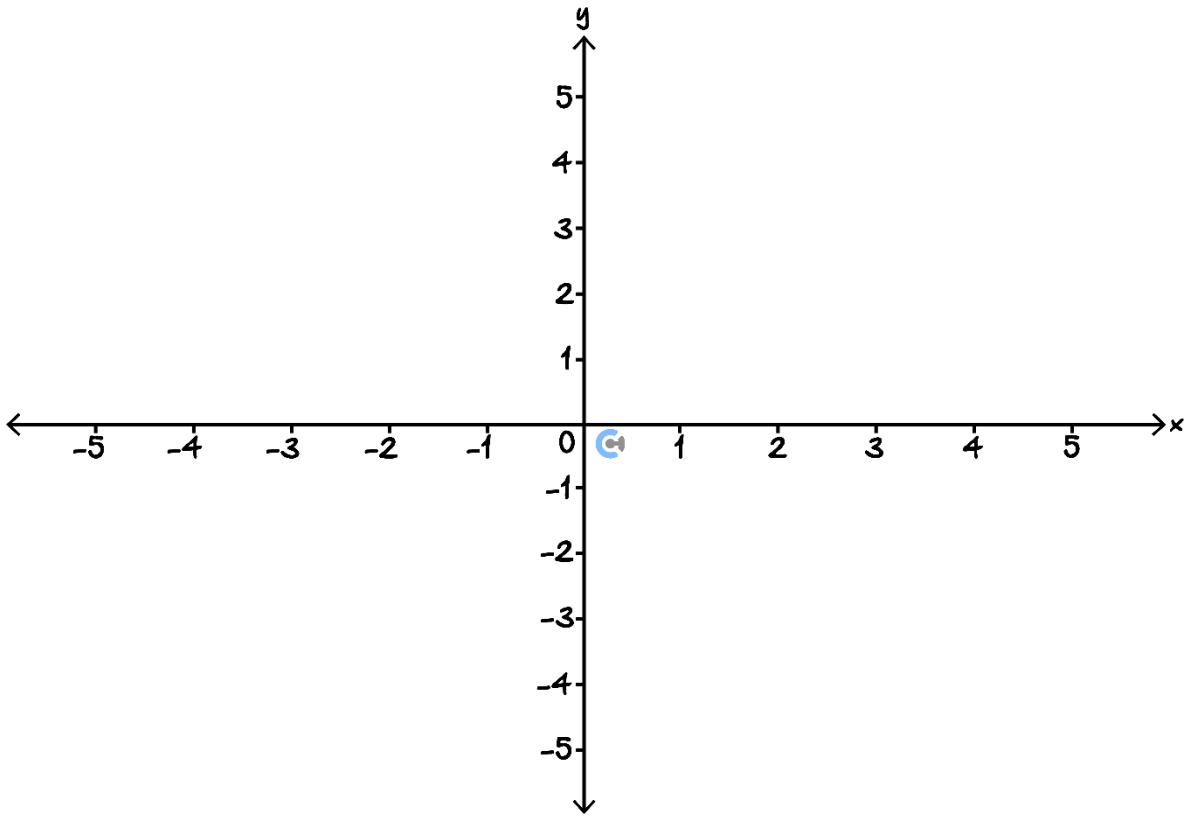
**Question 21**

Graph the following curve labelling all intercepts and asymptotes with their equations.

$$y = 3 - \frac{2}{5 - 3x}$$

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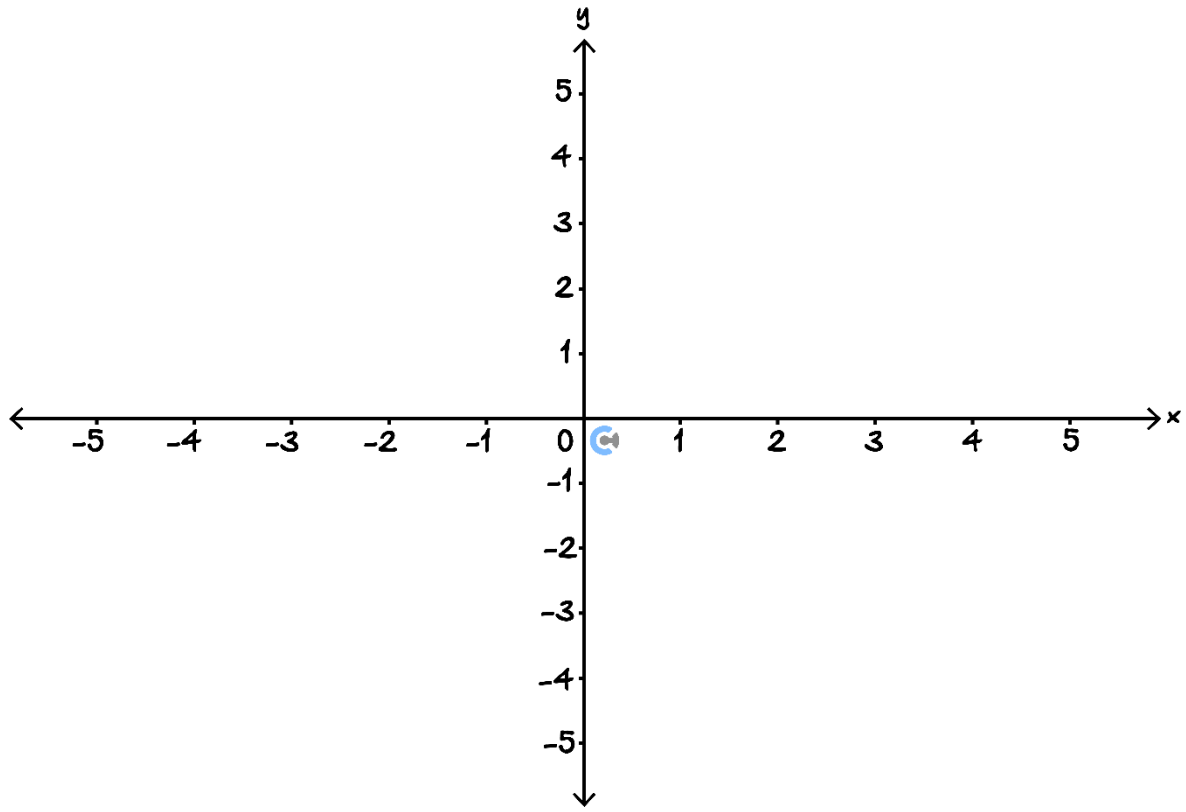
**Question 22**

Graph the following curve labelling all intercepts and asymptotes with their equations.

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

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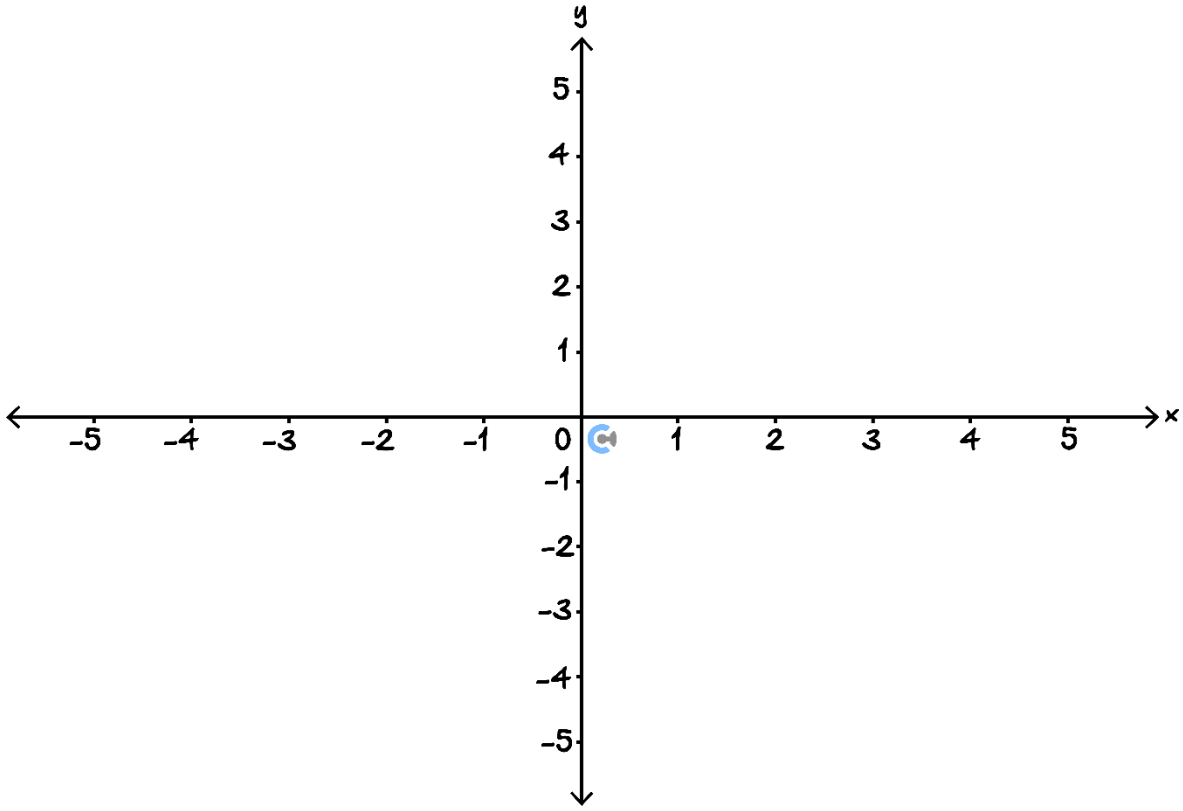
## Sub-Section [2.1.2]: Sketch and Find the Rule of Truncus Functions

**Question 23**

Graph the following curve labelling all intercepts and asymptotes with their equations.

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

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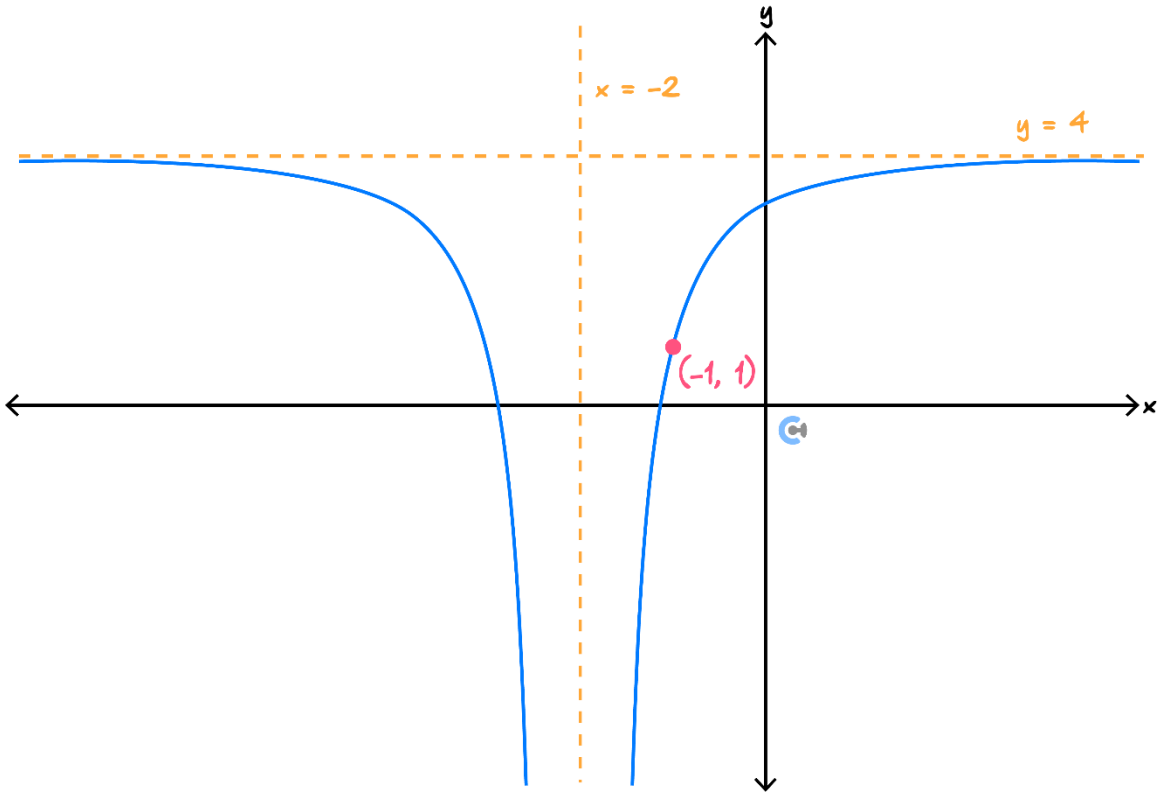
**Question 24**

Find the rule for the following graph, given it is of the form $y = \frac{a}{(x-h)^2} + k$.

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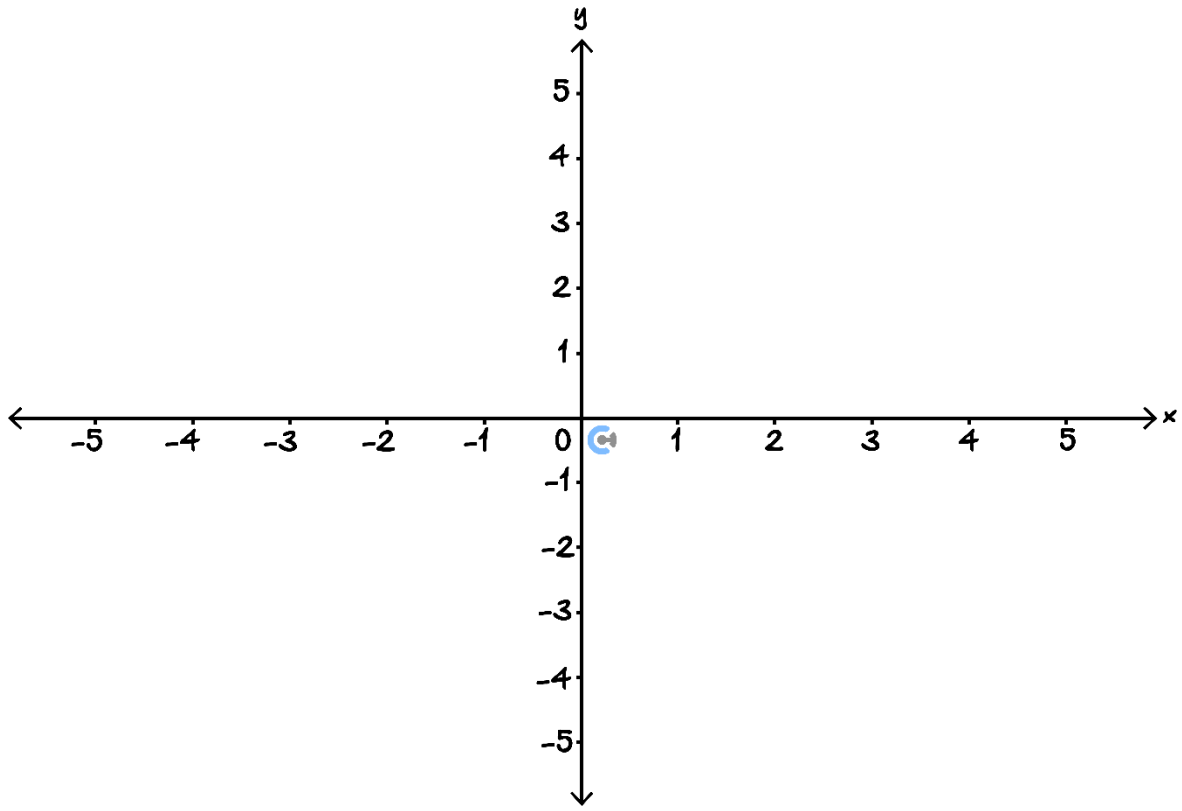
**Question 25**

Graph the following curve labelling all intercepts and asymptotes with their equations.

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

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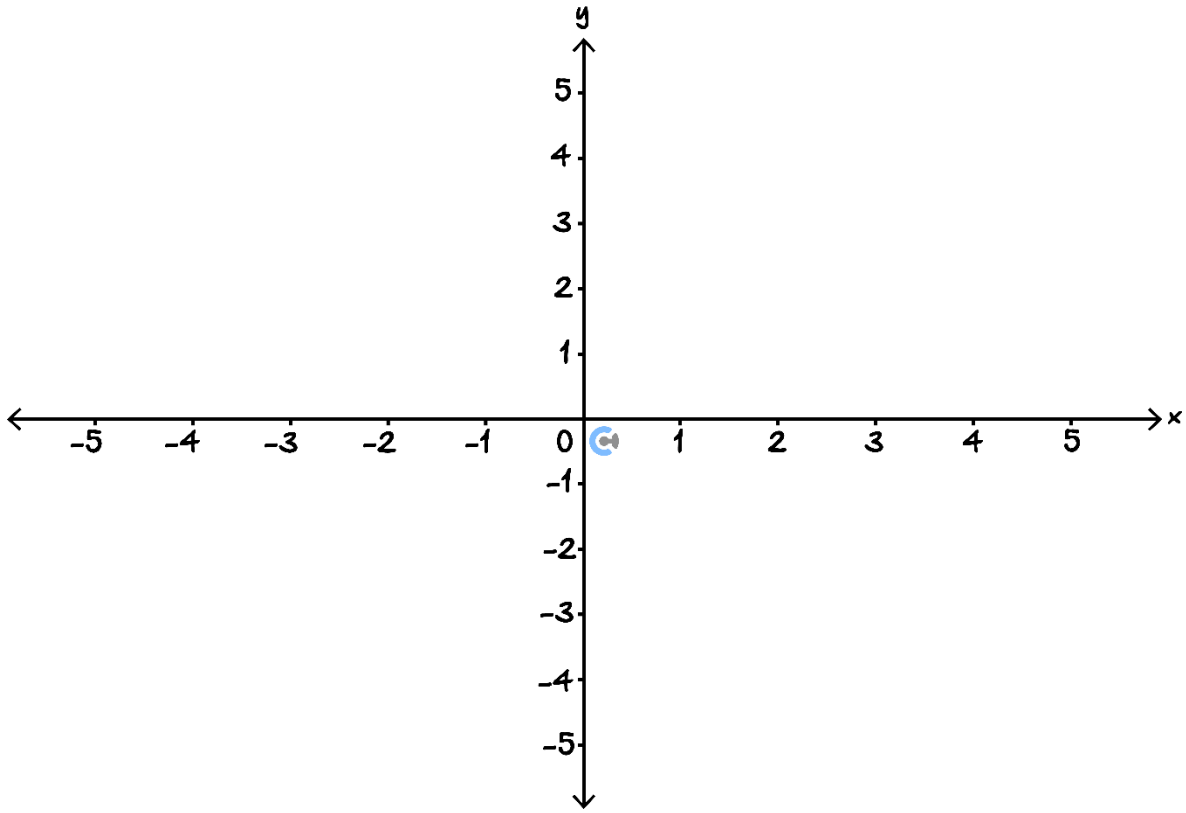
**Question 26**

Graph the following curve labelling all intercepts and asymptotes with their equations.

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

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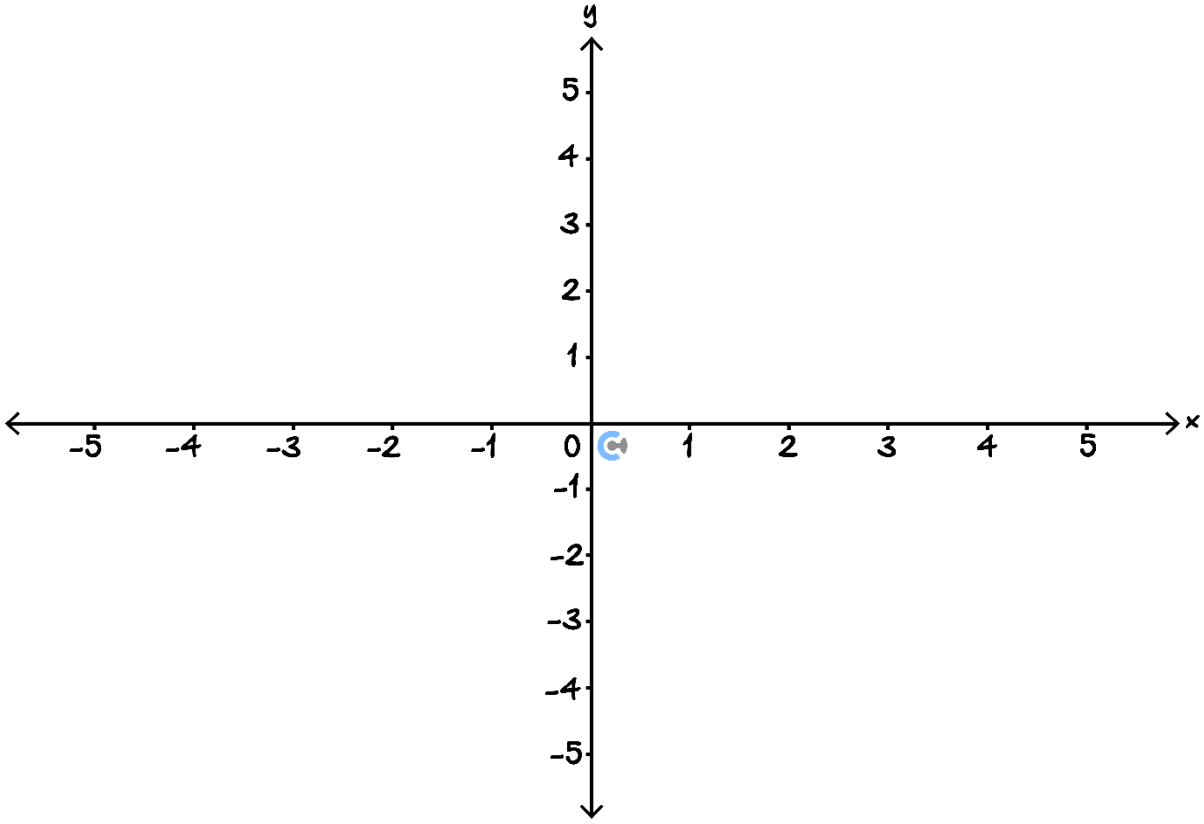
## Sub-Section [2.1.3]: Sketch and Find the Rule of Root Functions

**Question 27**

Graph the following curve labelling all intercepts and start points.

$$y = \sqrt{x - 2}$$

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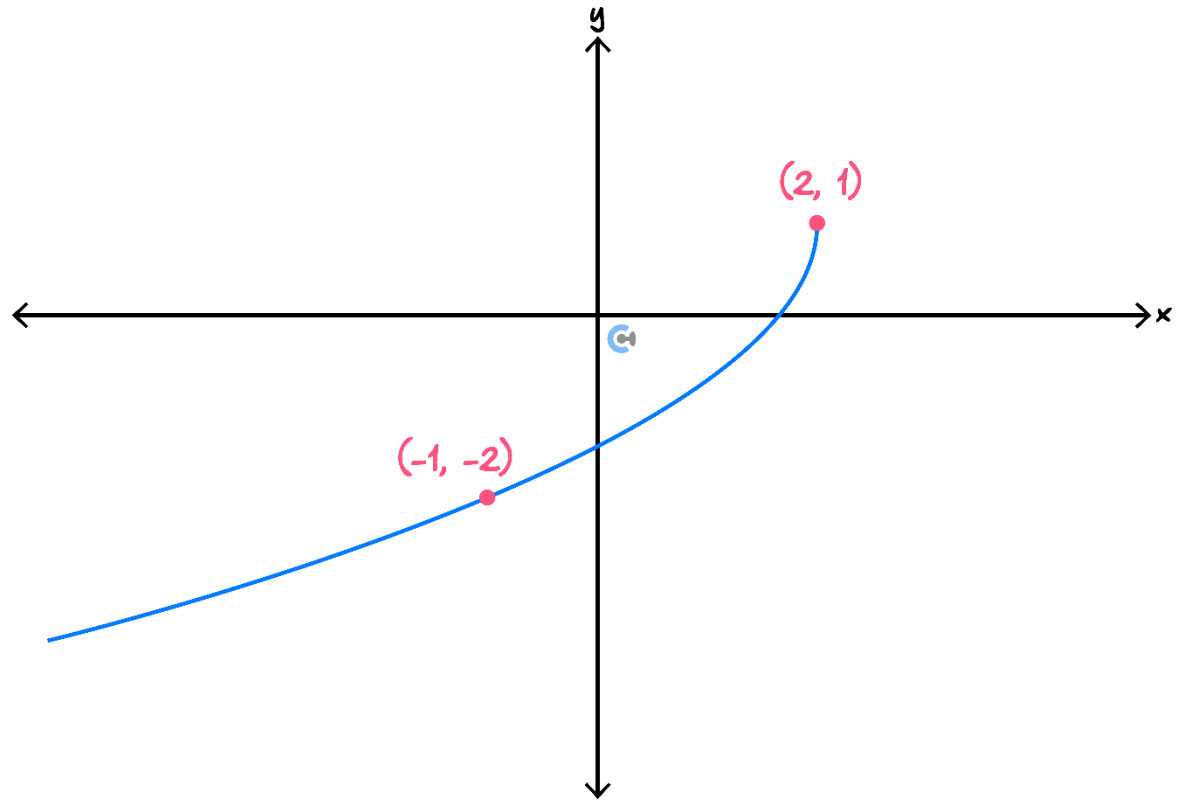
**Question 28**

Find the rule for the following graph, given it is of the form $y = a\sqrt{h - x} + k$.

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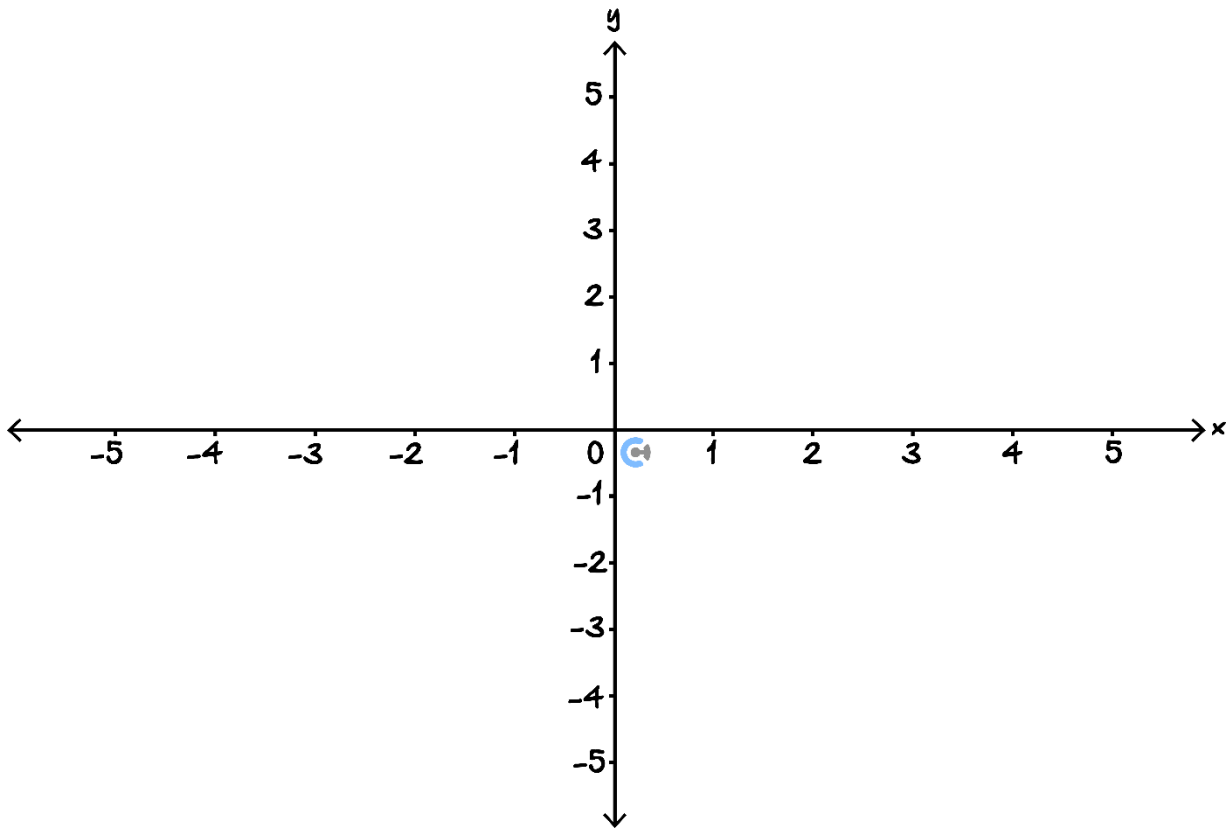
**Question 29**

Graph the following curve labelling all intercepts and start points.

$$y = 4 - \sqrt{5 - 2x}$$

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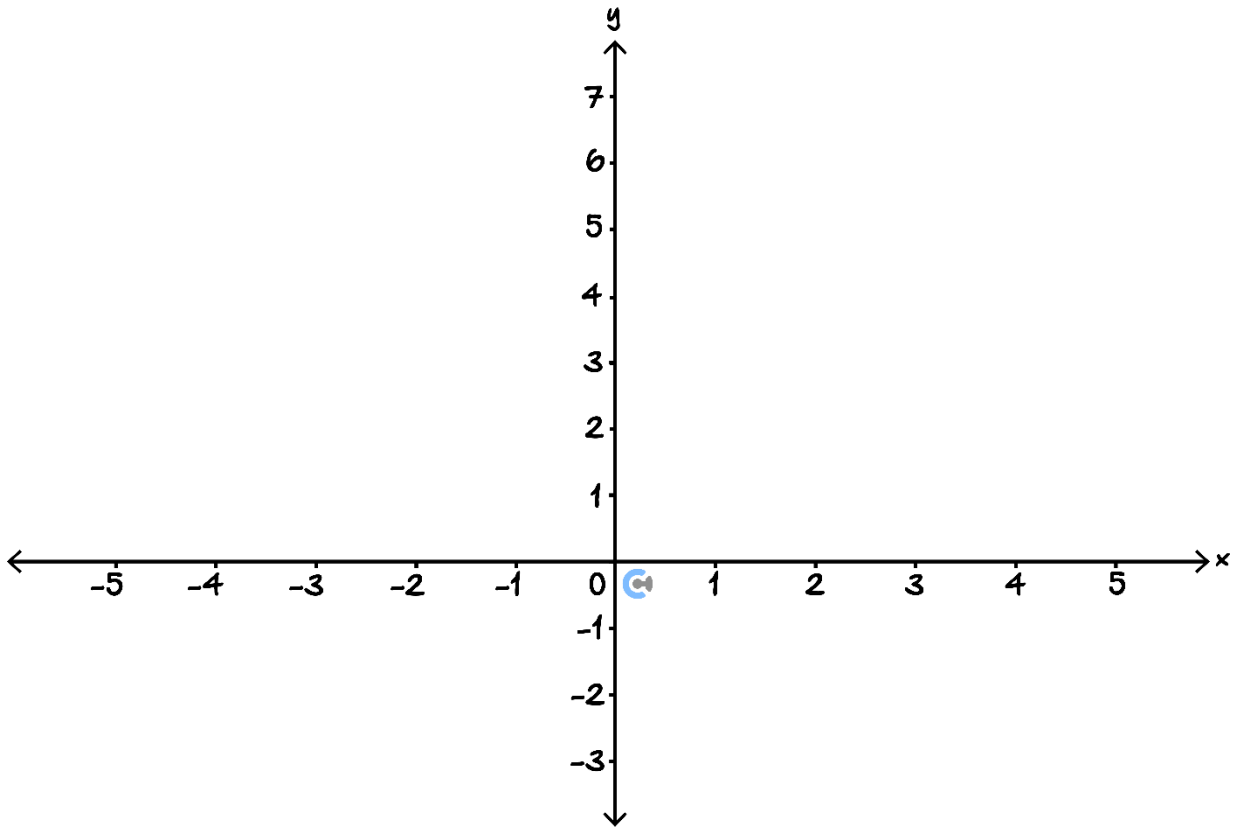
**Question 30**

Graph the following curve labelling all intercepts and turning points.

$$(y-3)^2 = 5-2x$$

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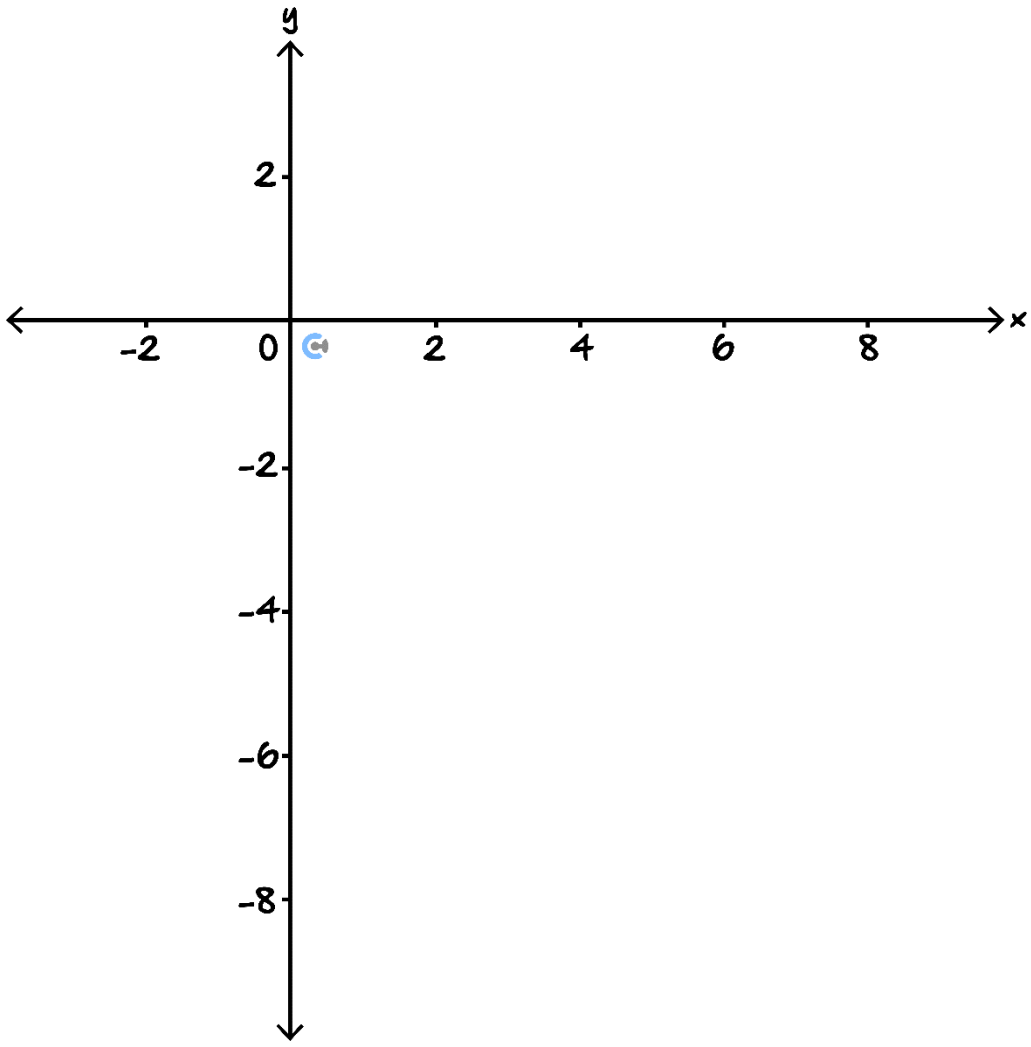
## Sub-Section [2.1.4]: Sketch and Find the Rule of Semicircles and Circles

**Question 31**

Graph the following circle, label all intercepts.

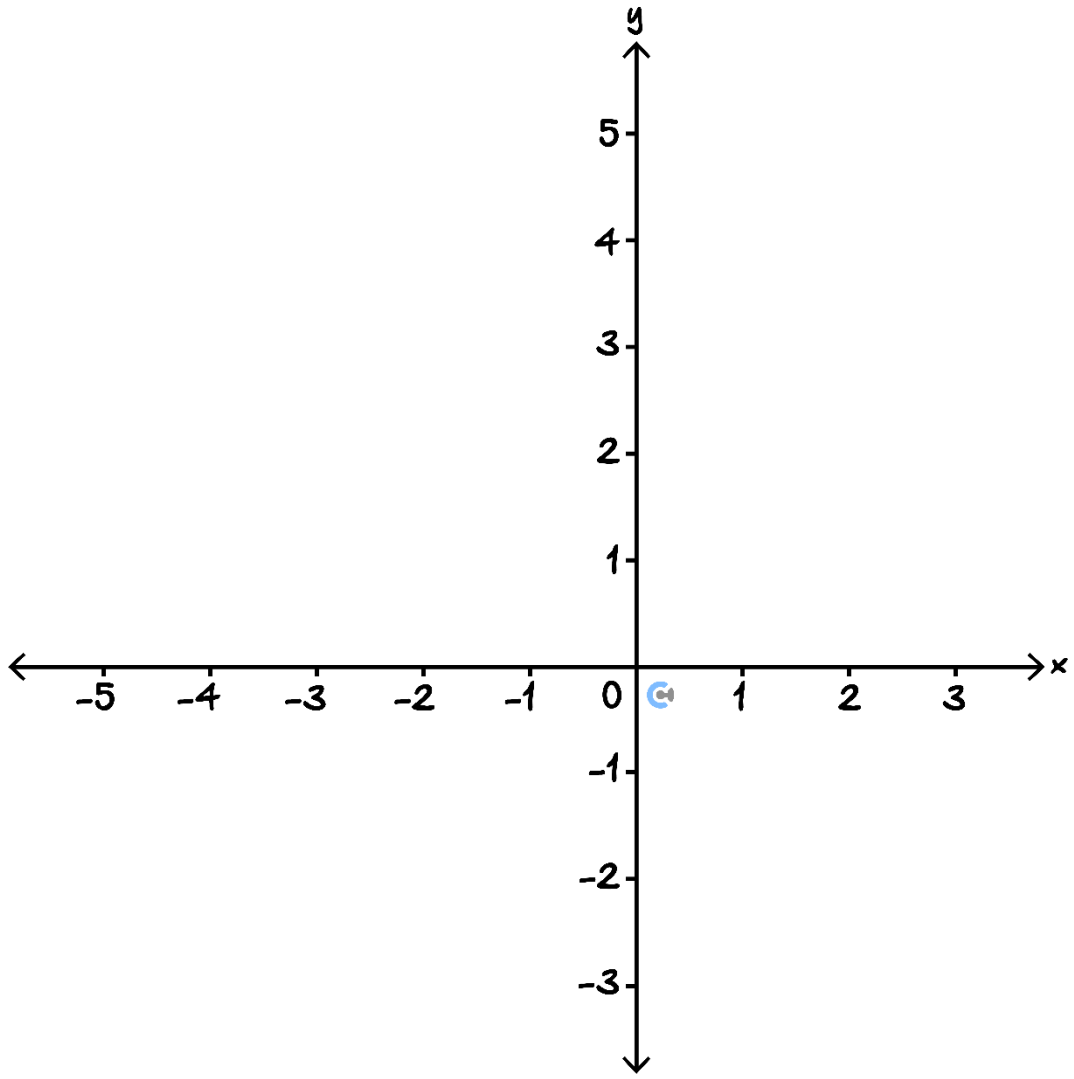
$$(x-3)^2+(y+4)^2=25$$



**Question 32**

Graph the following semi-circle, label all intercepts.

$$y = 3 - \sqrt{9 - (x + 2)^2}$$

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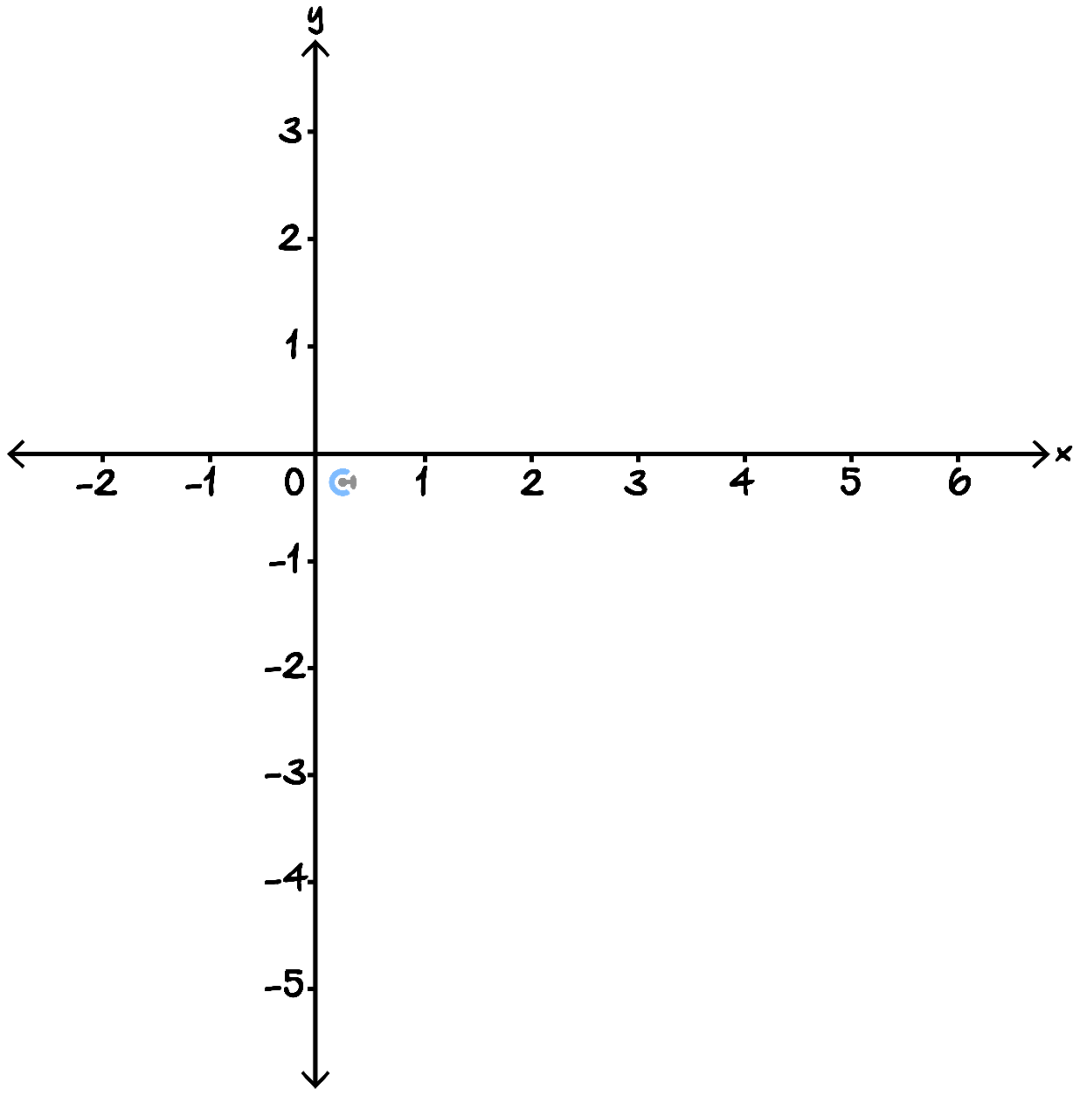
**Question 33**

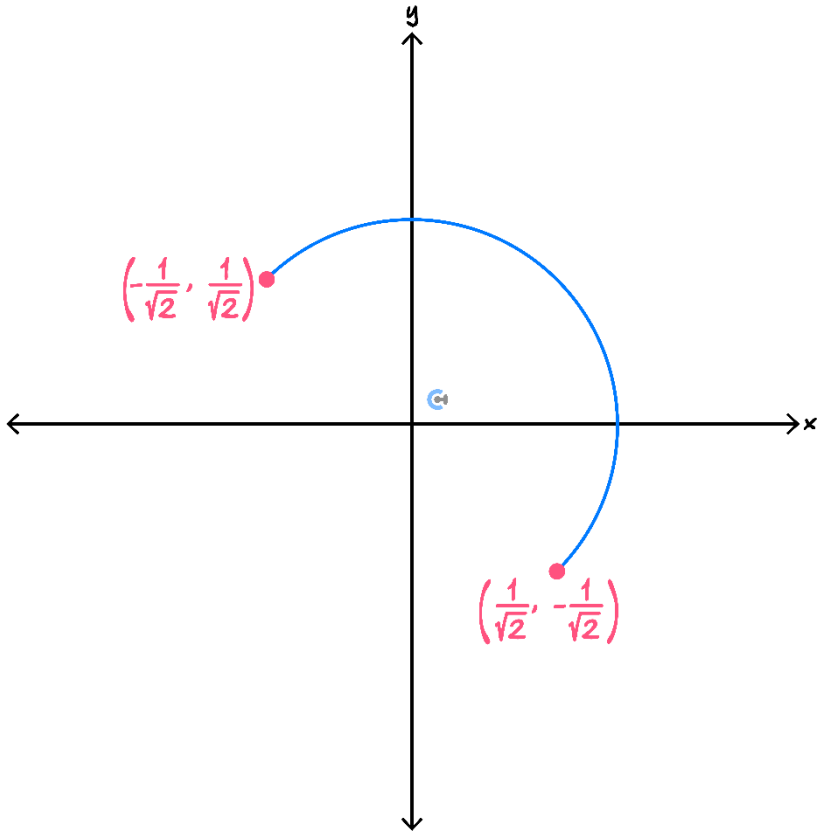
Graph the following circle, label all intercepts.

$$x^2 + y^2 + 2y - 4x = 4$$



**Question 34**

Determine the equation of the semi circle with radius 1 shown on the graph below.

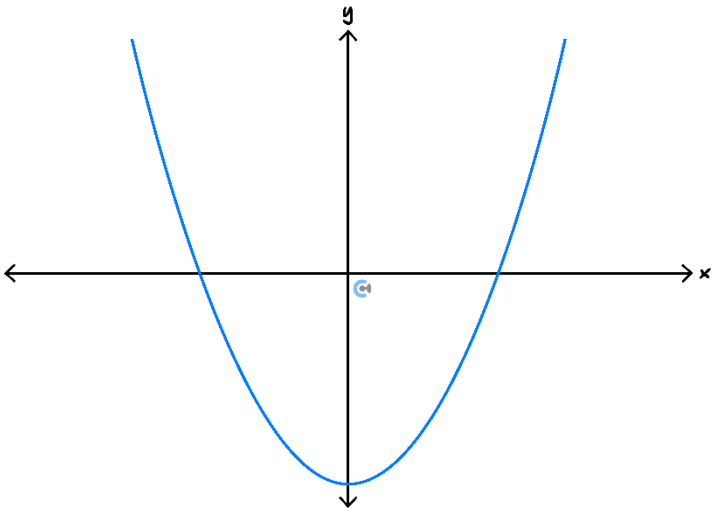


# Sub-Section [2.1.5]: Identify the Type of Relations and Identify Whether the Relation is a Function

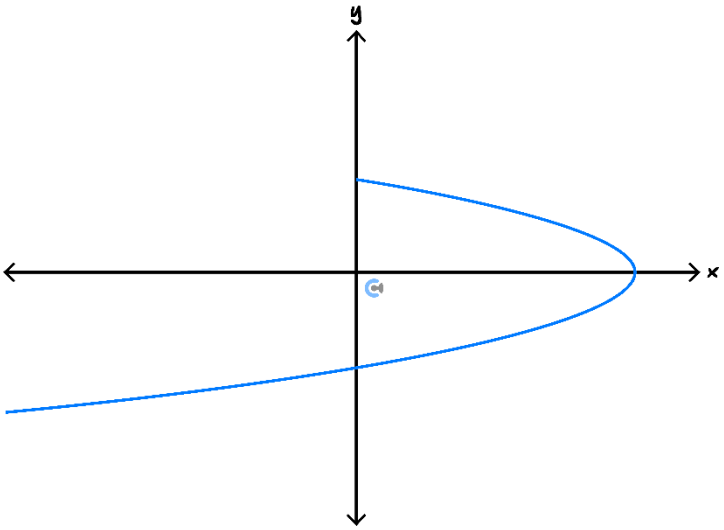
**Question 35**

For each of the following graphs, identify the type of relation depicted and whether the relation is a function.

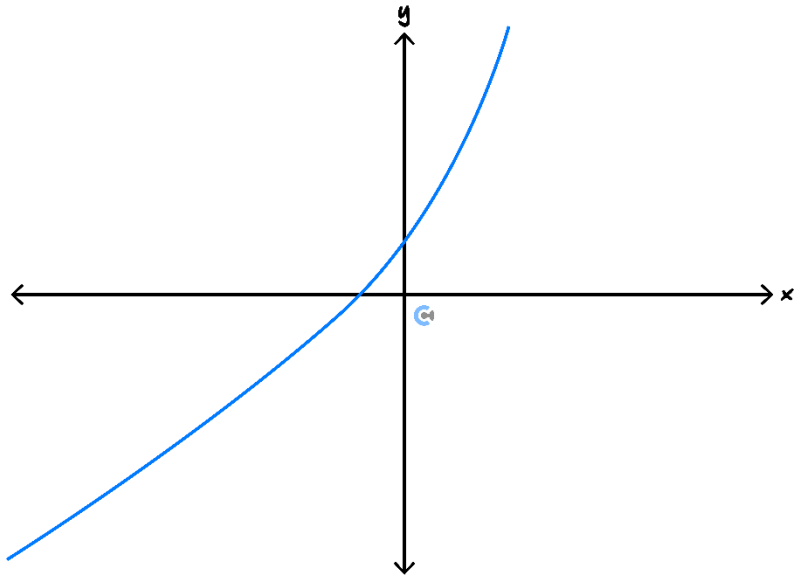
**a.**



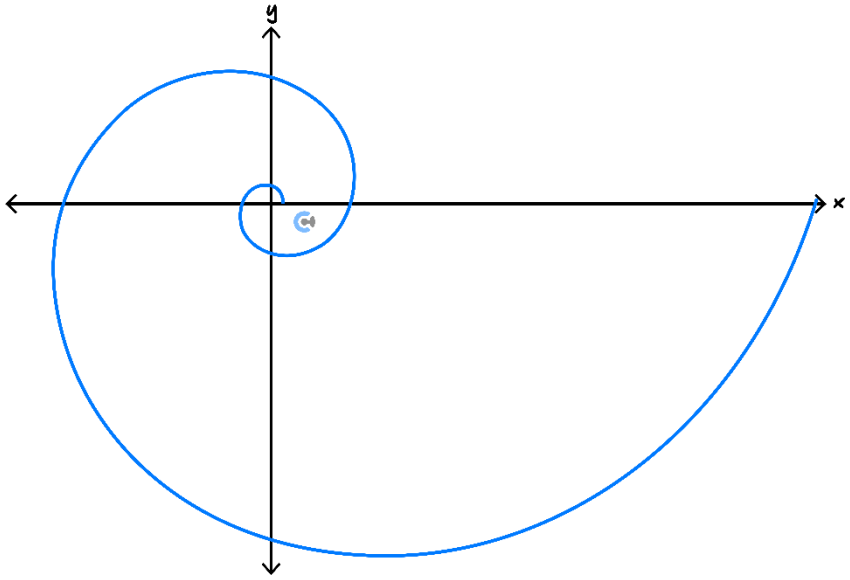

**b.**



**c.**




**d.**

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