UNIT 9: ABSOLUTE VALUE AND RECIPROCAL FUNCTIONS

Note-Taking Supplement

Student Package

Student's Name: _____

☐ Once completed, submit this package to your Learning Facilitator.

☐ Click on the "Unit 9 Note-Taking Supplement" link in your Moodle course and follow the instructions to submit your request for marking.

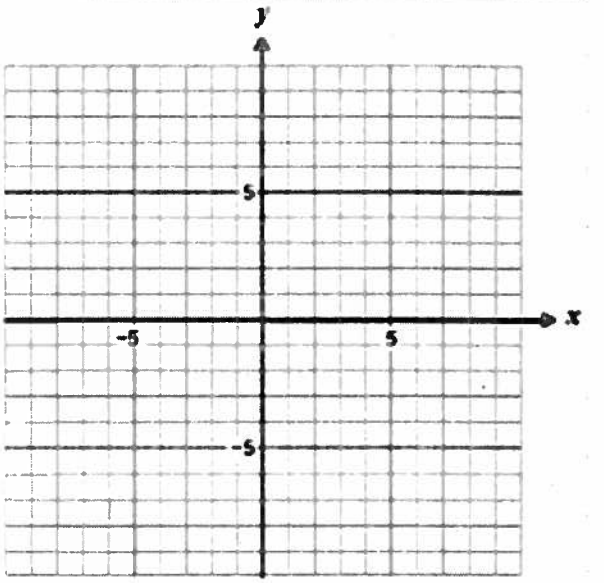
Date submitted:

Mark (out of 20):

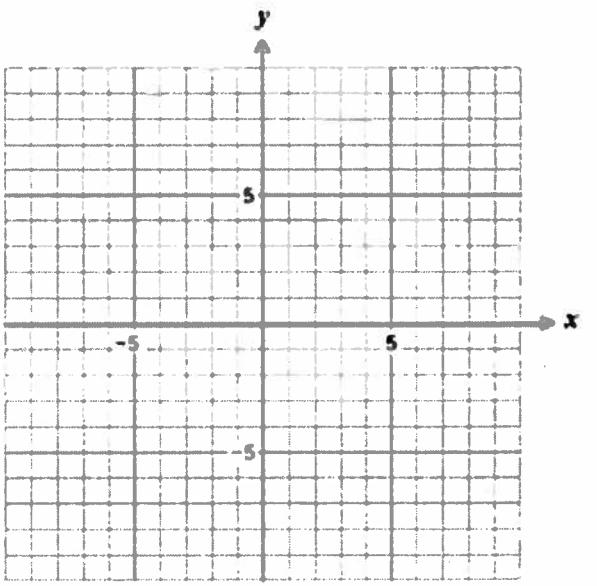
Lesson 1
Absolute Value Functions

1.1 The Absolute Value Function

The Simplest Absolute Value Function $y = |x|$

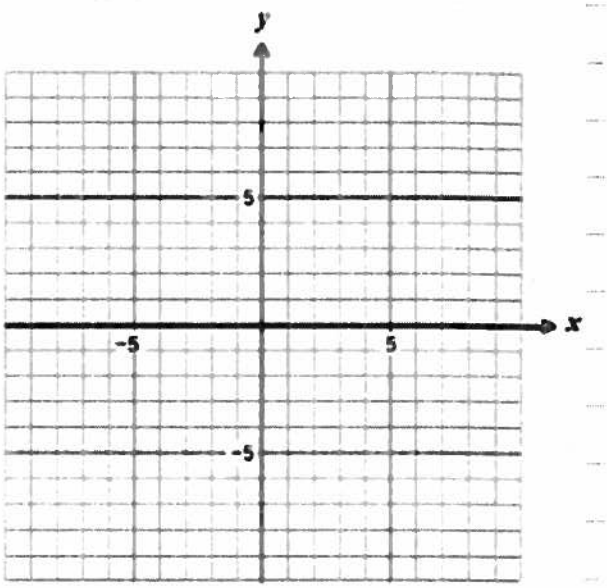


1.2 Compare $y = x$ to $y = |x|$



1.3 Graphing Absolute Value Functions

Graph $y = \left|\frac{2}{3}x + 1\right|$



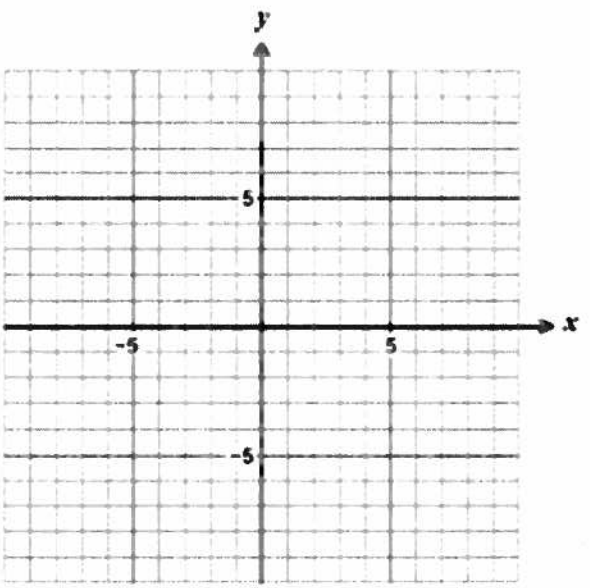
1.4 Graphing Absolute Value Functions

For the following absolute value function: $y = |-2x + 3|$

a) Determine the y-intercept and the x-intercept.

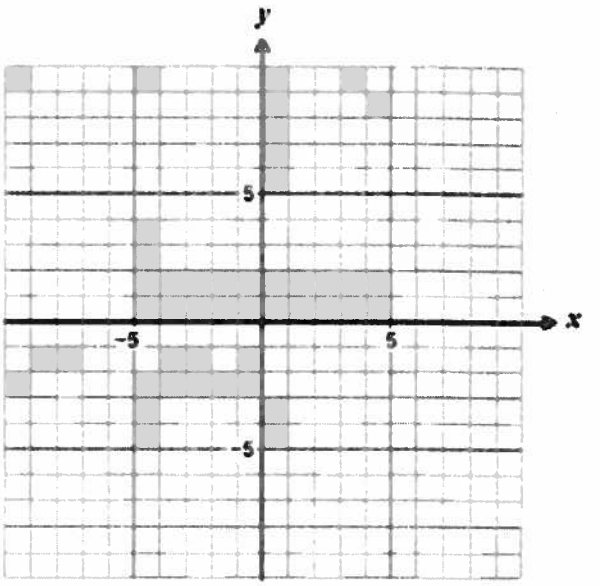
b) Sketch the graph.

c) State the domain and range.



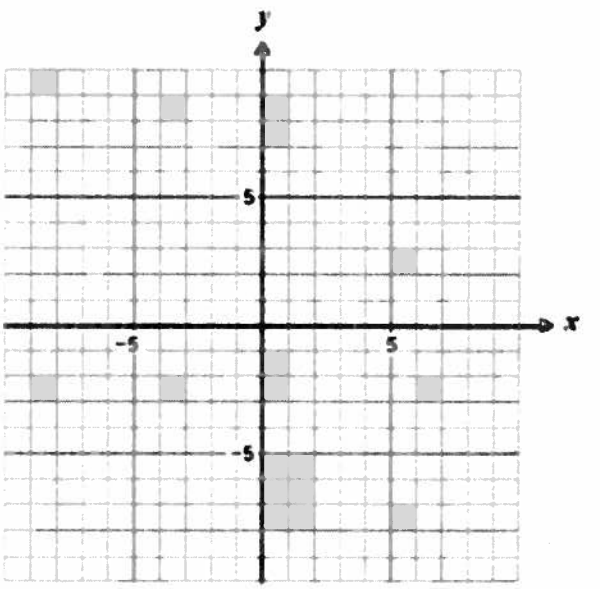
1.5 Graphing Absolute Value Functions

Graph $y = \left|\frac{1}{2}(x+1)^2 - 8\right|$



1.6 Graphing Absolute Value Functions

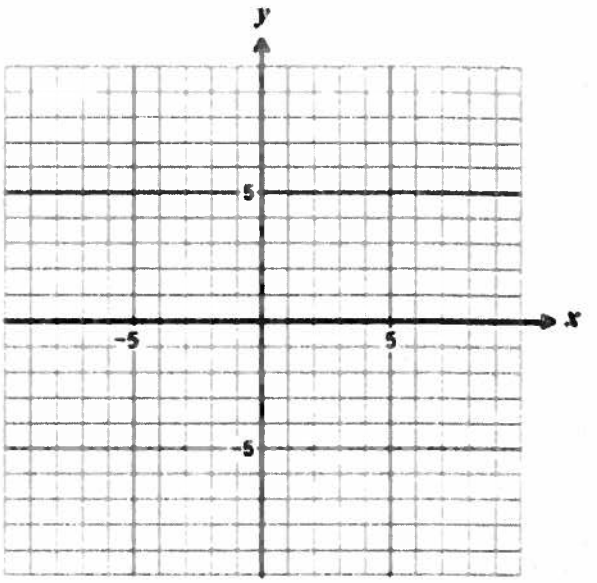
Graph $y = |-x^2 + 4x + 5|$



1.7 Graphing Absolute Value Functions

Graph $y = |-x^2 + 4x + 5|$

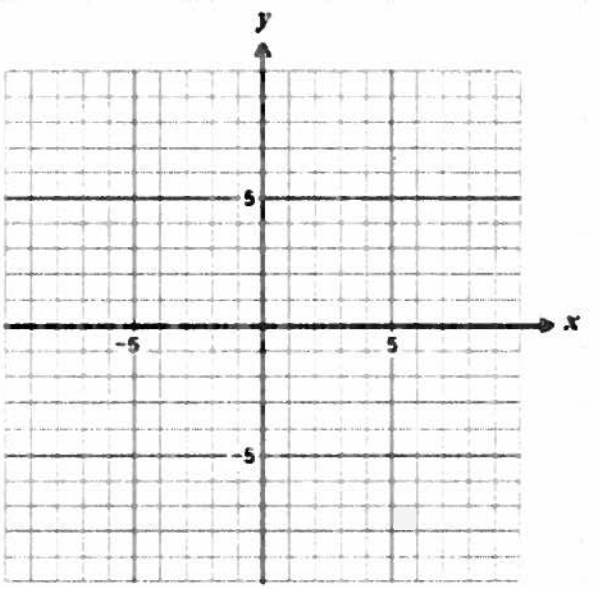
a) Determine the X-intercept and the Y-intercept.



1.8 Absolute Value-Piece Wise Functions

Graph $y = x$ if $x \geq 0$

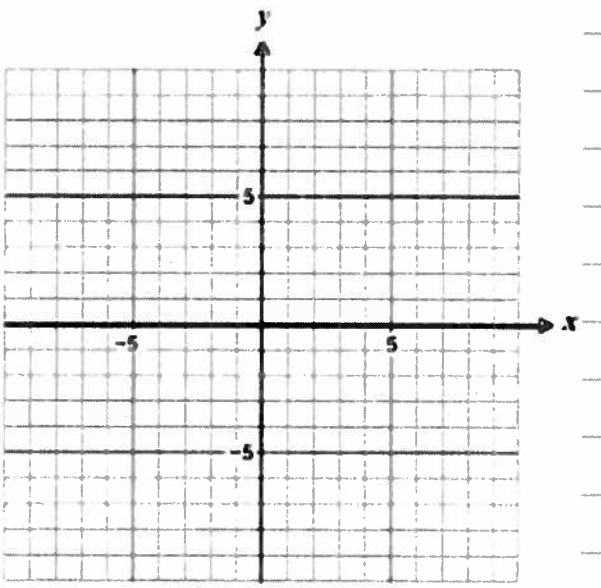
Graph $y = -x$ if $x < 0$



1.9 Absolute Value-Piece Wise Functions

For the absolute value function $f(x) = |2x - 3|$ express as a piecewise function.

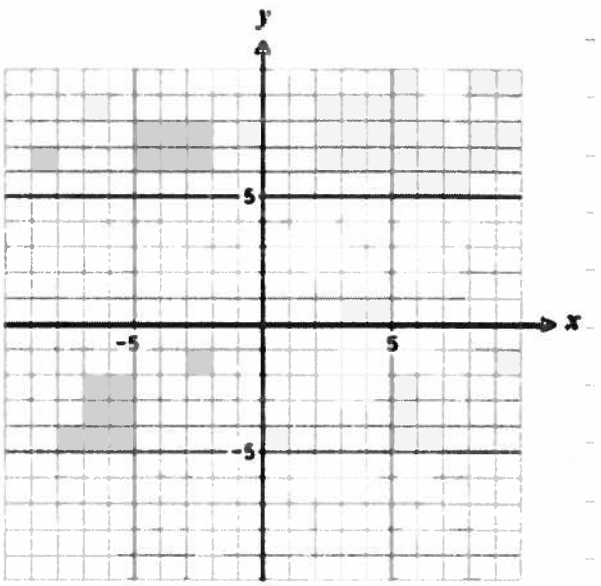
Graph $f(x) = |2x - 3|$.



1.10 Absolute Value-Piece Wise Functions

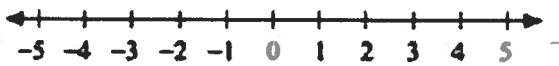
For the absolute value function $f(x) = |-2x^2 + 7x = 4|$ express as a piecewise function.

Note: (Use the X and Y intercepts to sketch the graph.)



Lesson 2
Solving Absolute Value Equations

2.1 Definition Absolute Value



2.1 Definition Absolute Value

Applying the definition of absolute value to solve absolute value equations.

$|x| = 11$

Solve algebraically. $|x| + 7 = -1$

2.3 Solving Absolute Value Equations

Example 1 Solve the following absolute value equation algebraically

$|x + 3| = 12$

2.4 Solving Absolute Value Equations

Example 2 Solve the following absolute value equations algebraically.

a) $|3x - 2| = 10$

b) $6 - |7 - x| = 4$

c) $\left|\frac{x}{2} - 4\right| = 5 - 4x$

2.5 Solving Absolute Value Equations

Example 3 Solve the following absolute value equation algebraically.

$$|x + 2| = |x - 8|$$

2.6 Solving Absolute Value Equations

Example 4 Solve the following absolute value equation algebraically.

$$|x + 7| - |x - 3| = 0$$

2.7 Solving Absolute Value Equations

Example 5 Solve the following absolute value equation algebraically.

$$|x + 1| + |x - 3| = 8$$

2.8 Solving Absolute Value Equations

Example 6 Solve the following absolute value equation algebraically.

a) $|x - 2| + |x + 3| = 7$

b) $|x - 4| - |x + 5| = 9$

Lesson 3
Graphing Linear Reciprocal Functions

3.1 The Reciprocal Function

Example:

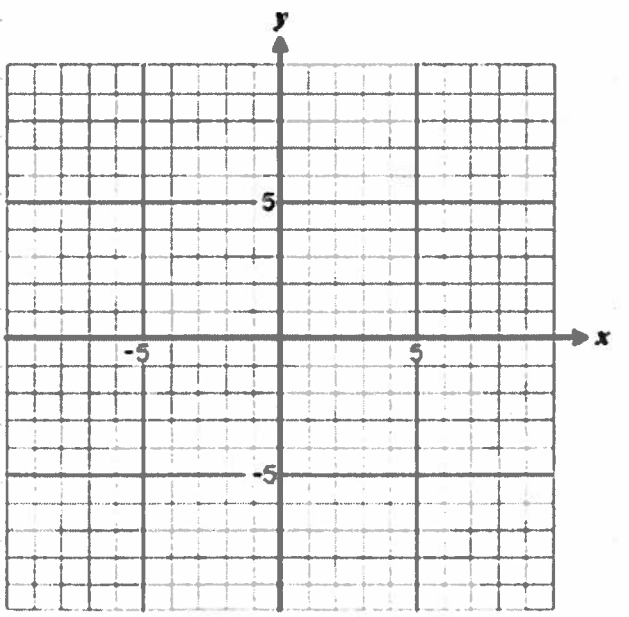
1.) Write the reciprocal function of the following:

a) $y = x^3 + 1$

b) $y = (x-1)^2 + 1$

3.2 The Reciprocal Function

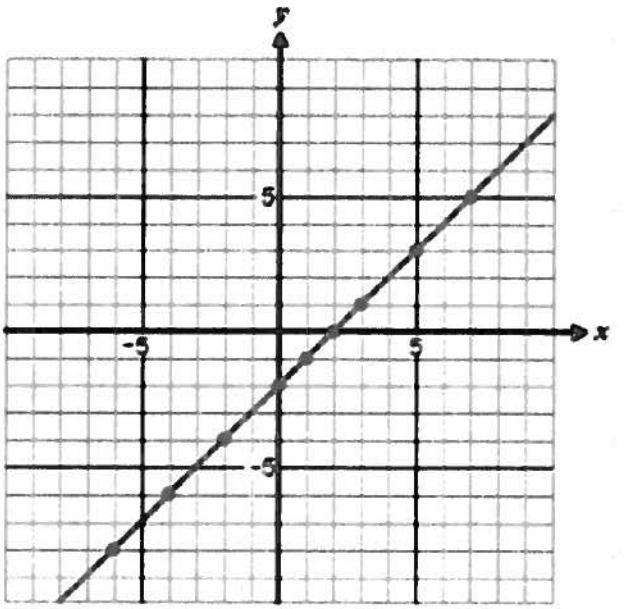
I. Comparing $y = x - 2$ to $y = \dfrac{1}{x-2}$



3.3 The Reciprocal Function

1. Comparing $y = x - 2$ to $y = \dfrac{1}{x - 2}$

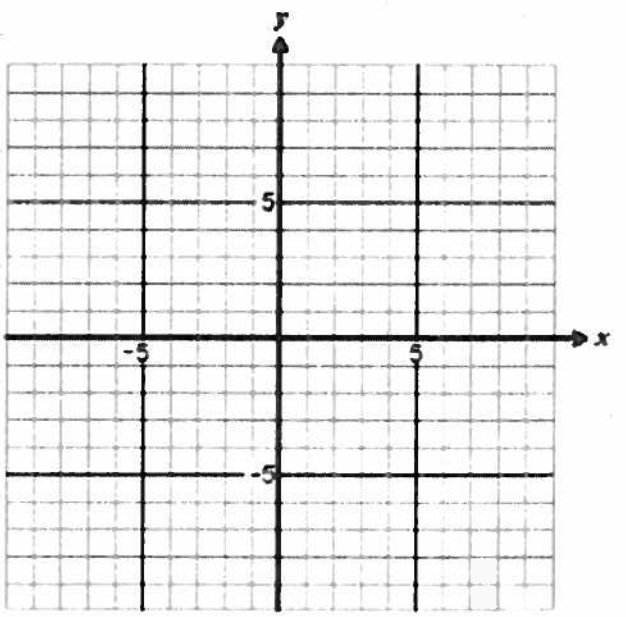
Let's learn how to graph the reciprocal function quickly and easily!



3.4 Graphing Reciprocal Linear Functions

Sketch the graph of $y = f(x)$ and $y = \dfrac{1}{f(x)}$ if, $f(x) = -2x + 6$

Label the asymptotes, the invariant points and the intercepts.

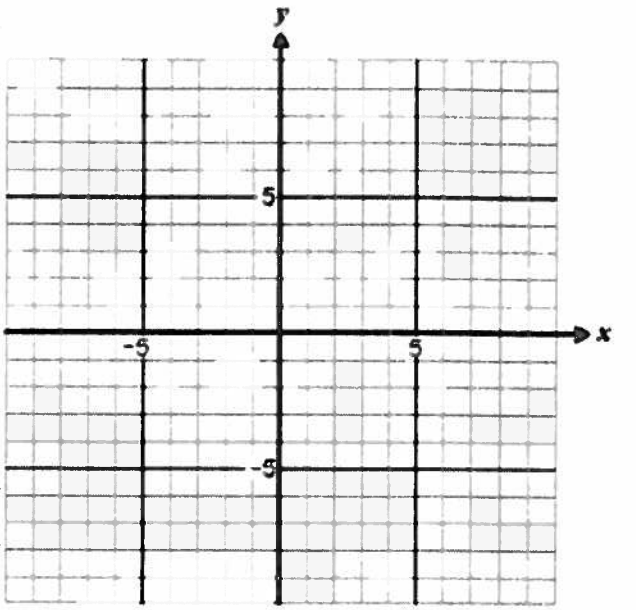


3.5 Graphing Reciprocal Linear Functions

Sketch the graph of $y = f(x)$ and

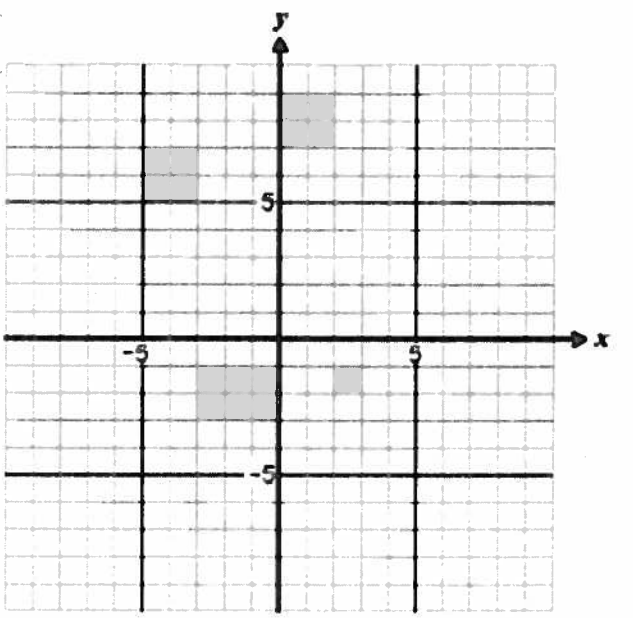
Label the asymptotes, the invariant points and the intercepts.

Asymptotes:



3.6 Graphing Reciprocal Linear Functions

Sketch the graph of $f(x) = \dfrac{1}{\frac{2}{3}x + 2}$



3.7 Graphing Reciprocal Linear Functions

For $f(x) = 13x - 6$ determine the following without graphing.

a) the equation of the vertical asymptote for $y = \frac{1}{f(x)}$

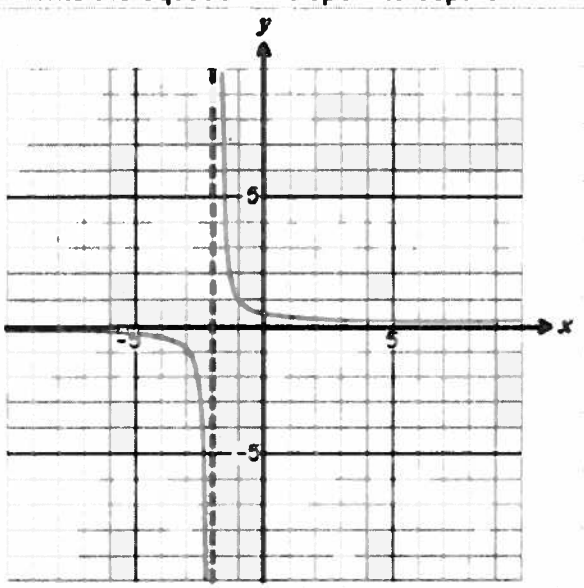
b) The coordinates of the invariant points of $y = \frac{1}{f(x)}$

c) The intercepts of $y = \frac{1}{f(x)}$

3.8 Reciprocal to Linear Functions

Use the graph of $y = \frac{1}{f(x)}$ to write the equation of the linear function $y = f(x)$.

Write the equation in slope intercept form.



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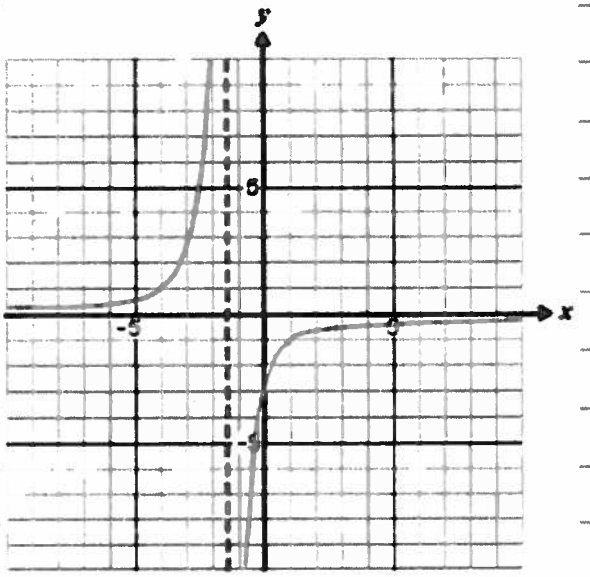
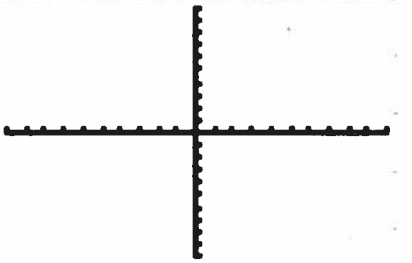


Lesson 4
Using Technology to Graph Reciprocal Quadratic Functions

4.1 Graphing Reciprocal Functions with Technology

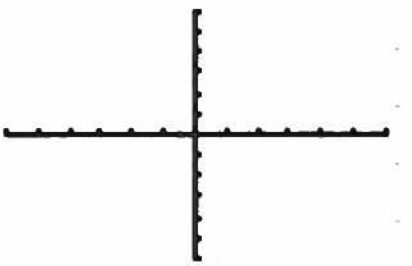
Graph $y = x^2 - 4$

What are the coordinates of the x-intercepts?



Can find x-intercepts algebraically.

Graph $y = \dfrac{1}{x^2 - 4}$ How many vertical asymptotes are there?

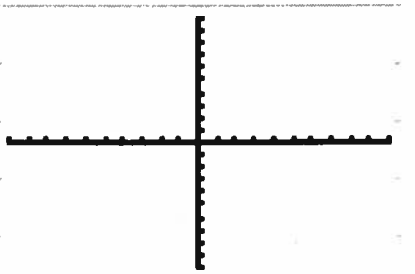


What are the equations of the vertical asymptotes?

4.2 Graphing Reciprocal Functions with Technology

Graph $y = x^2 + 2$

What are the coordinates of the x-intercepts?



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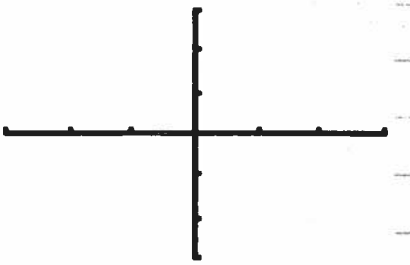


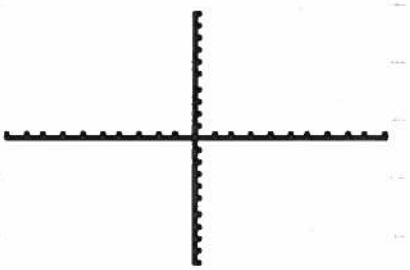
What happens to the value of "y" when x approaches very large values?

Will "y" ever reach 0?

4.3 Graphing Reciprocal Functions with Technology

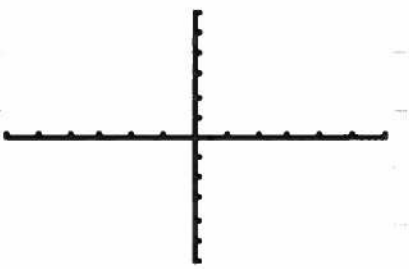
Graph $y = x^2$

What are the coordinates of the x-intercepts?



Can find x-intercepts algebraically.

Graph $y = \frac{1}{x^2}$ How many vertical asymptotes are there?



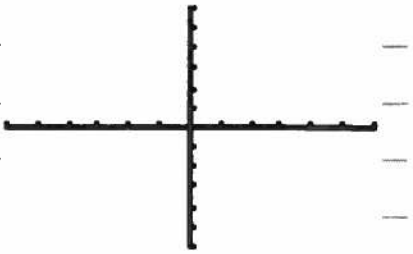
What is the equation of the vertical asymptote?

What is the equation of the horizontal asymptote?

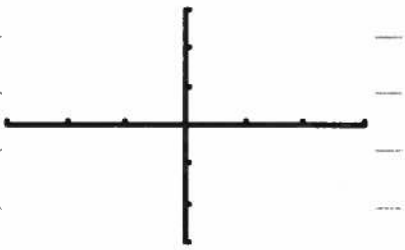
4.4 Graphing Reciprocal Functions with Technology

Reciprocal Quadratic Functions

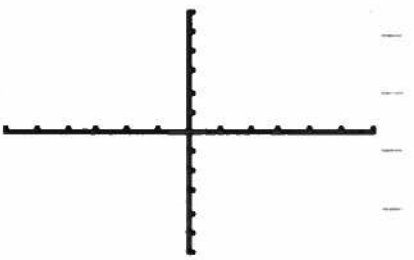
$$y = \frac{1}{x^2 - 4}$$



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



$$y = \frac{1}{x^2}$$



For which values of q does the graph of $y = \frac{1}{x^2 + q}$ have:

a) 2 vertical asymptotes?

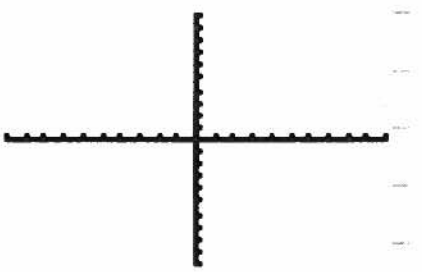
b) No vertical asymptotes?

c) 1 vertical asymptote?

4.5 Graphing Reciprocal Functions with Technology

Graph $y = -x^2 + 4$

What are the coordinates of the x-intercepts?

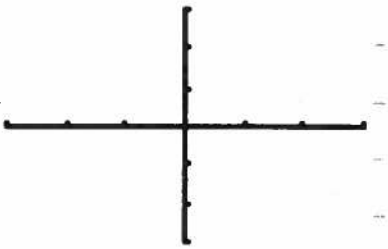


Can find x-intercepts algebraically.

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

How many vertical asymptotes are there?

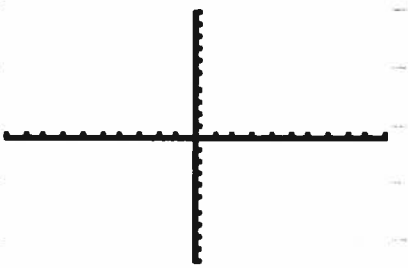
What are the equations of the vertical asymptotes?



4.6 Graphing Reciprocal Functions with Technology

Graph $y = -x^2 - 2$

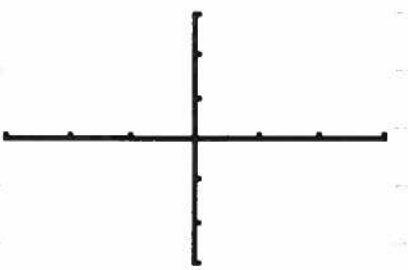
What are the coordinates of the x-intercepts?



Graph $y = \dfrac{1}{-x^2 - 2}$

How many vertical asymptotes are there?

What happens to the value of "y" when x approaches very large values?

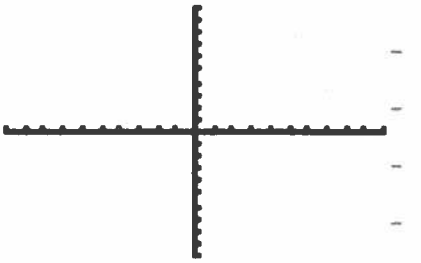


Will "y" ever reach 0?

4.7 Graphing Reciprocal Functions with Technology

Graph $y = -x^2$

What are the coordinates of the x-intercepts?



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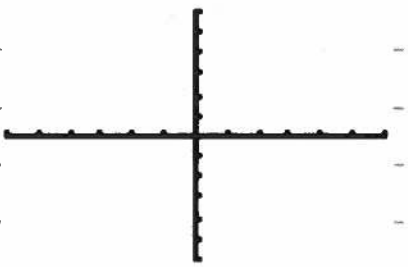
Graph $y = \frac{1}{-x^2}$ How many vertical asymptotes are there?



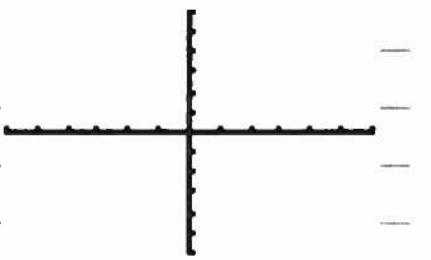
What is the equation of the vertical asymptote?

What is the equation of the horizontal asymptote?

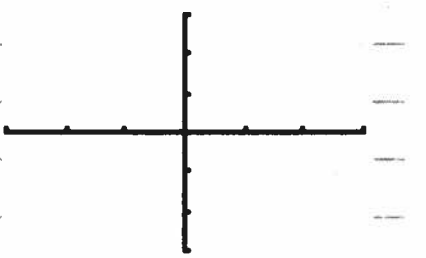
4.8 Graphing Reciprocal Functions with Technology

Reciprocal Quadratic Functions

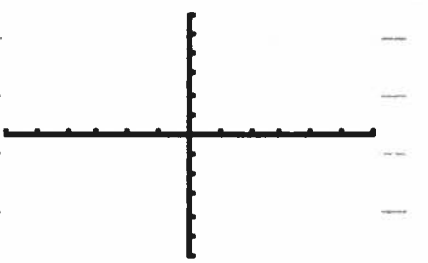
$y = \frac{1}{x^2 - 4}$



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



$y = \frac{1}{x^2}$



For which values of q does the graph of $y = \frac{1}{-x^2 + q}$ have:

a) 2 vertical asymptotes?

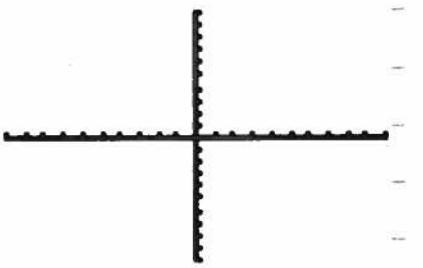
b) No vertical asymptotes?

c) 1 vertical asymptote?

4.9 Graphing Reciprocal Functions with Technology

Graph $y = (x + 2)^2 - 4$

What are the coordinates of the x-intercepts?



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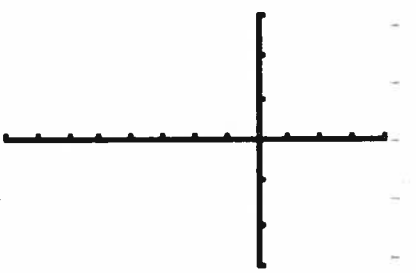
Graph $y = \frac{1}{(x + 2)^2 - 4}$ How many vertical asymptotes are there?

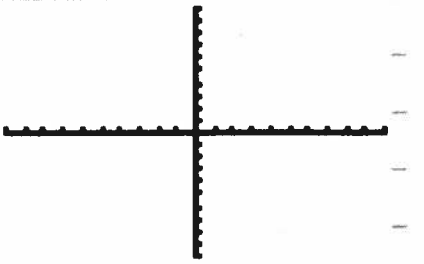


What are the equations of the vertical asymptotes?

4.10 Graphing Reciprocal Functions with Technology

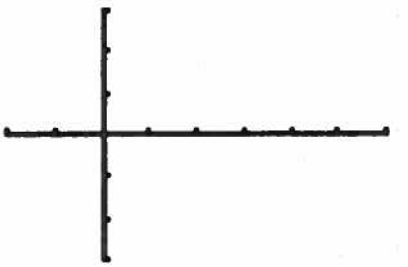
Graph $y = (x-3)^2 + 2$

What are the coordinates of the x-intercepts?



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

How many vertical asymptotes are there?



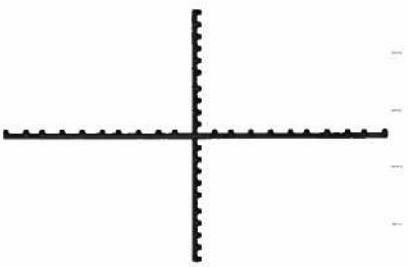
What happens to the value of "y" when x approaches very large values?

Will "y" ever reach 0?

4.11 Graphing Reciprocal Functions with Technology

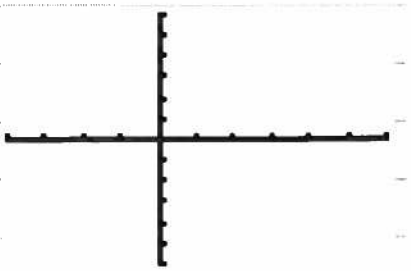
Graph $y = (x-2)^2$

What are the coordinates of the x-intercepts?



Can find x-intercepts algebraically.

Graph $y = \dfrac{1}{(x-2)^2}$ How many vertical asymptotes are there?

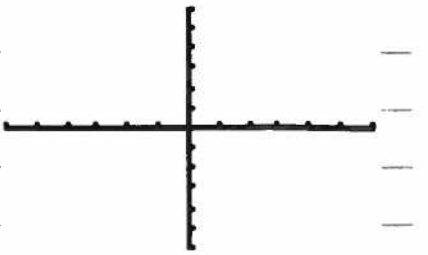


What is the equation of the vertical asymptote?

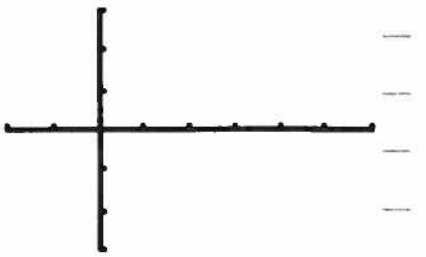
4.12 Graphing Reciprocal Functions with Technology

Reciprocal Quadratic Functions

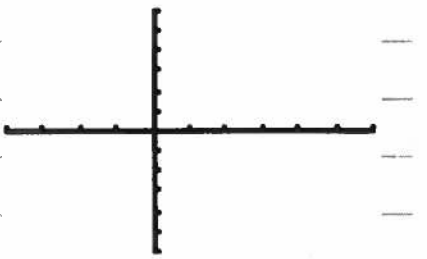
$$y = \frac{1}{(x+2)^2 - 4}$$



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



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



For which values of q does the graph of $y = \frac{1}{a(x-p)^2 + q}$ have:

a) 2 vertical asymptotes?

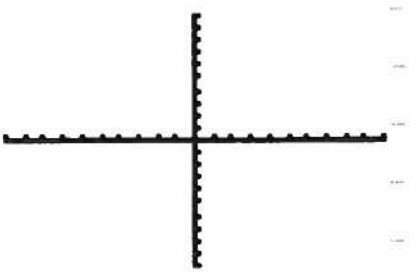
b) No vertical asymptotes?

c) 1 vertical asymptote?

4.13 Graphing Reciprocal Functions with Technology

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

What are the coordinates of the x-intercepts?

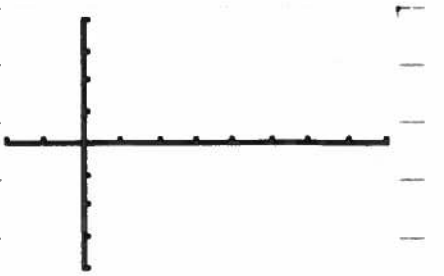


Can find x-intercepts algebraically.

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

How many vertical asymptotes are there?

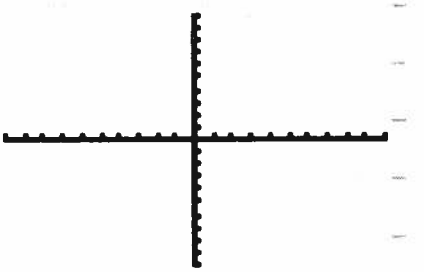
What are the equations of the vertical asymptotes?



4.14 Graphing Reciprocal Functions with Technology

Graph $y = -(x+4)^2 - 2$

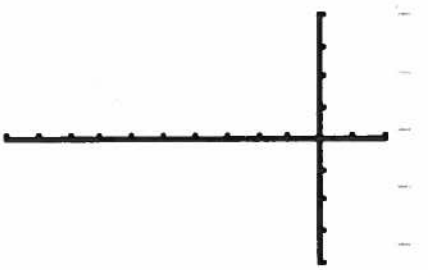
What are the coordinates of the x-intercepts?



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

How many vertical asymptotes are there?

What happens to the value of "y" when x approaches very large values?

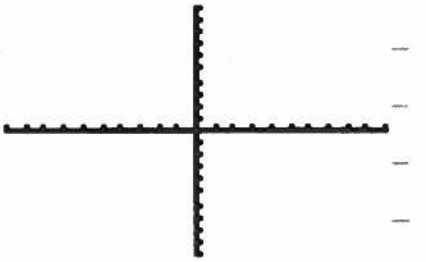


Will "y" ever reach 0?

4.15 Graphing Reciprocal Functions with Technology

Graph $y = -(x-2)^2$

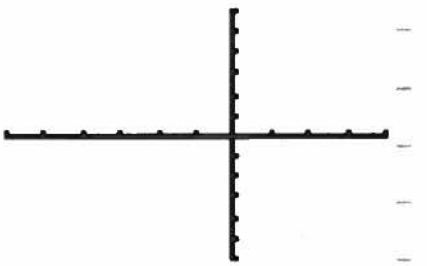
What are the coordinates of the x-intercepts?



Can find x-intercepts algebraically.

Graph $y = \dfrac{1}{-(x-2)^2}$

How many vertical asymptotes are there?

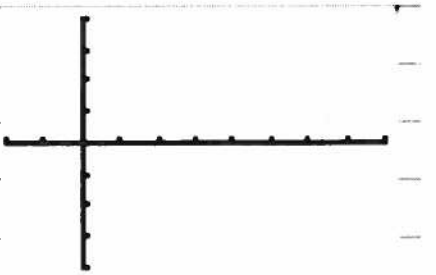


What is the equation of the vertical asymptote?

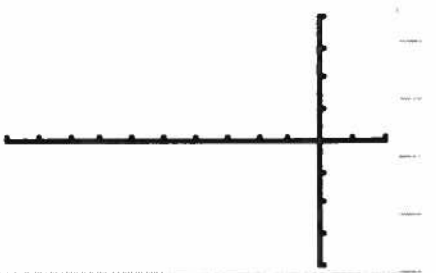
4.12 Graphing Reciprocal Functions with Technology

Reciprocal Quadratic Functions

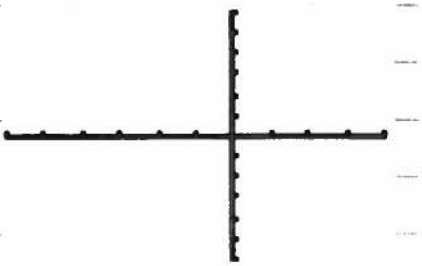
$y = \dfrac{1}{-(x-3)^2 + 4}$



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



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



For which values of q does the graph of $y = \frac{1}{a(x-p)^2 + q}$ have:

a) 2 vertical asymptotes?

b) No vertical asymptotes?

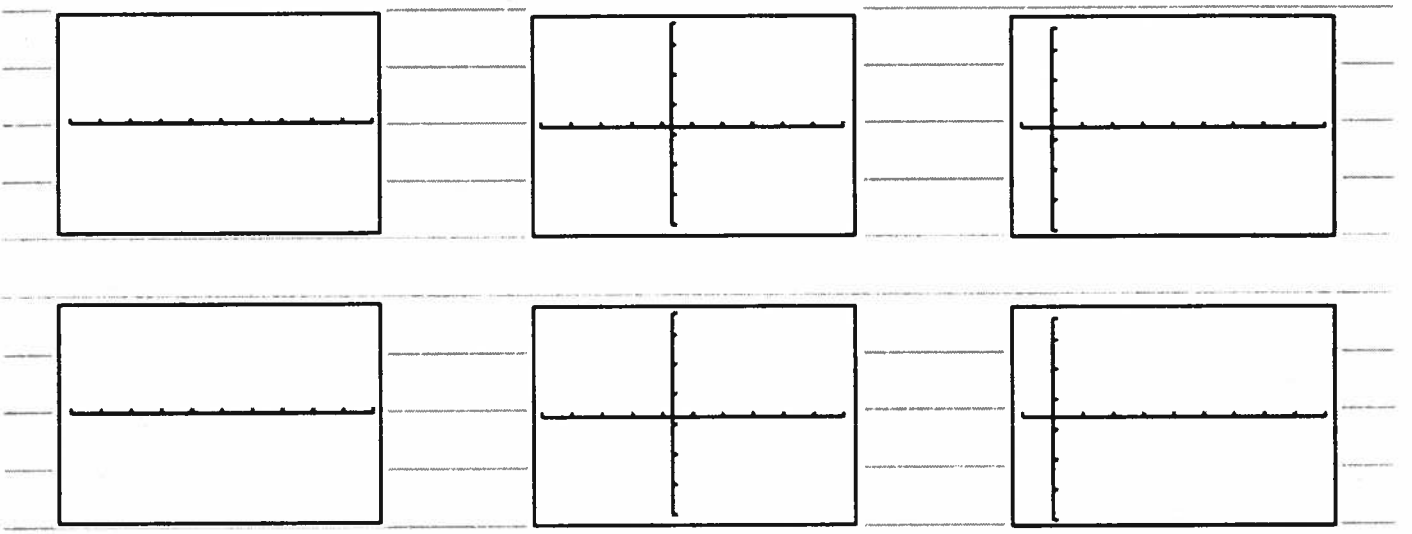
c) 1 vertical asymptote?

Lesson 5
Graphing Reciprocal Quadratic Functions

5.1 Graphing Reciprocal Function

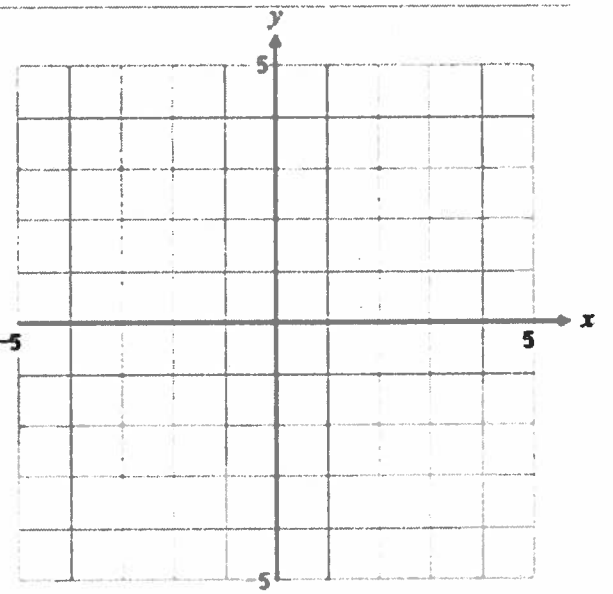
Three possible shapes of reciprocal quadratic functions.

Shape 1 *Shape 2* *Shape 3*



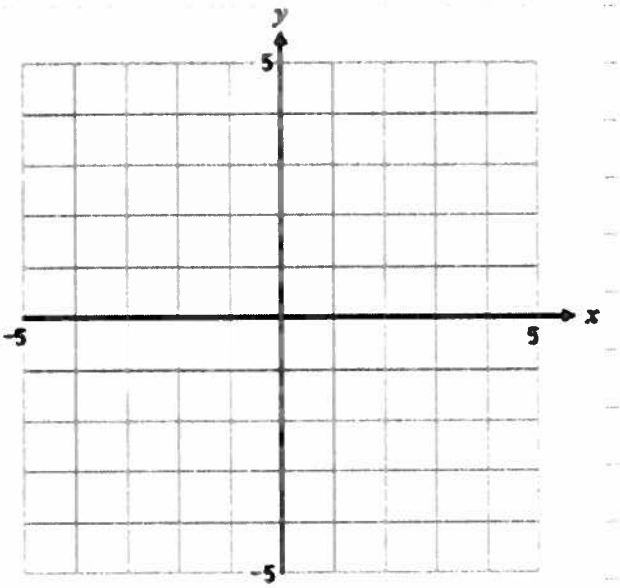
5.2 Using Pencil and Grid to Graph

Graph $y = \dfrac{1}{x^2 - 4}$



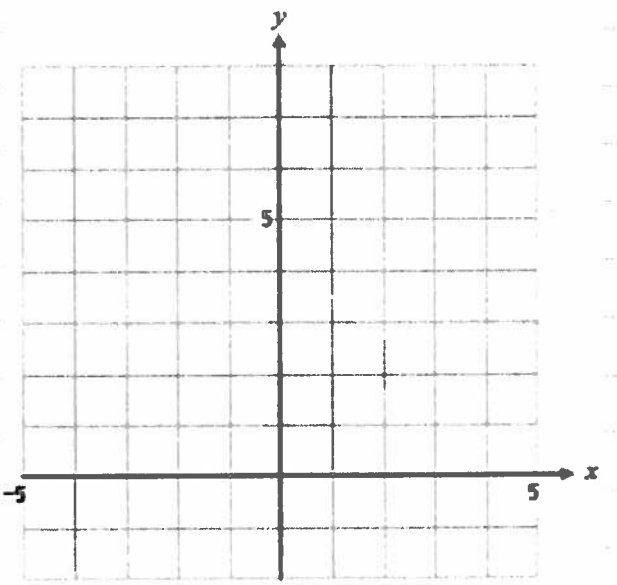
5.3 Using Pencil and Grid to Graph

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



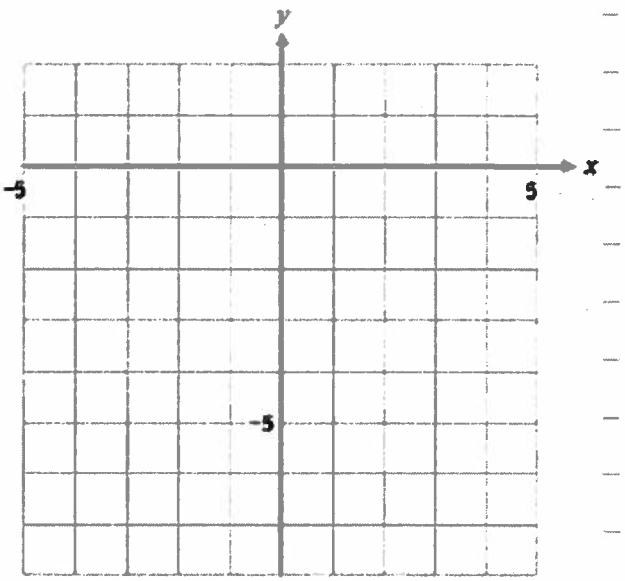
5.4 Using Pencil and Grid to Graph

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



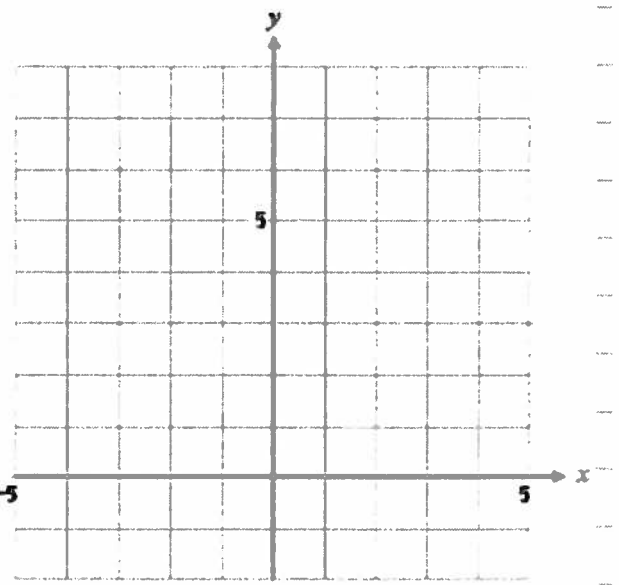
5.5 Using Pencil and Grid to Graph

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



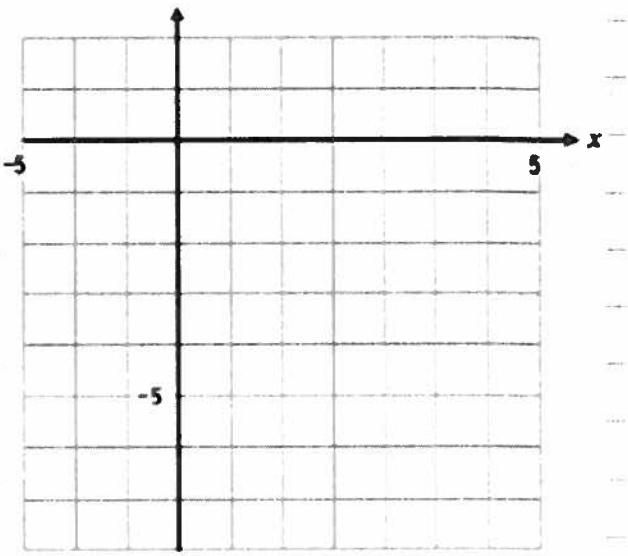
5.6 Using Pencil and Grid to Graph

Graph $y = \dfrac{1}{x^2+2}$



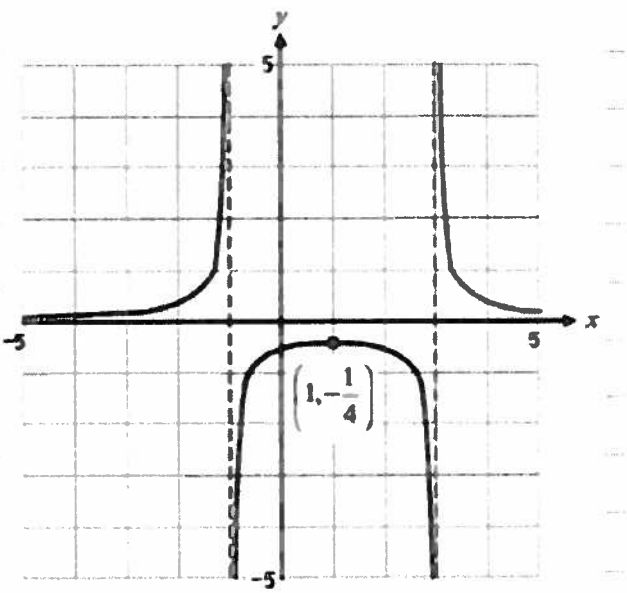
5.7 Using Pencil and Grid to Graph

Graph $y = \dfrac{1}{-(x-2)^2 - 3}$



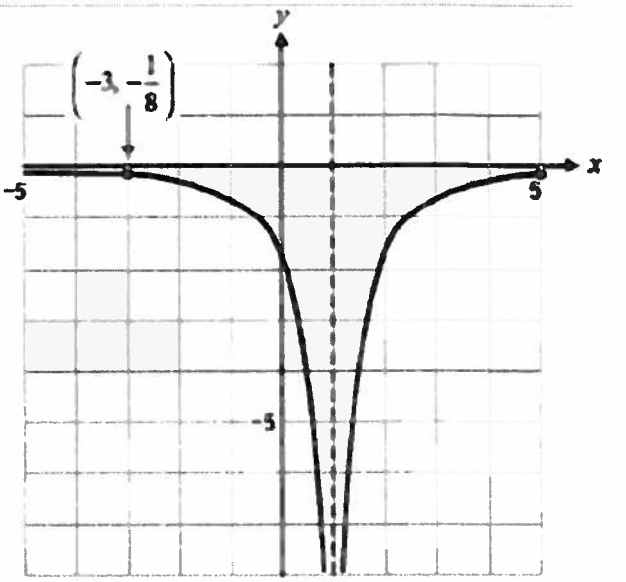
5.8 Finding Graph of $y = f(x)$ given $y = \dfrac{1}{f(x)}$

Given the graph of $y = \dfrac{1}{f(x)}$, graph $y = f(x)$ where $f(x)$ is a quadratic function.



5.9 Finding Graph of $y = f(x)$ given $y = \frac{1}{f(x)}$

a) Graph $y = f(x)$ where $f(x)$ is a quadratic function.



b) Determine the equation of the quadratic function.

Write equation in $y = a(x - h)^2 + k$ form.

c) Determine the exact coordinates of the points that are the same for both functions.