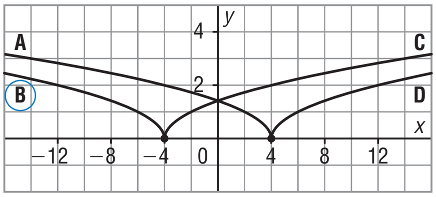
PRACTICE TEST, pages 154–156

1. Multiple Choice Which graph represents $y = \sqrt{-0.5x - 2}$?



2. Multiple Choice Which statement about the graph of

$y = \dfrac{x^2 - 5x + 6}{x - 3}$ is true?

A. There is a vertical asymptote with equation $y = 3$.

B. There is an oblique asymptote with equation $y = x - 2$.

C. There is a horizontal asymptote with equation $x = 2$.

D. There is a hole at (3, 1).

3. Without using graphing technology, graph the function $y = \dfrac{x^2 + 3x + 2}{x^2 - x - 2}$. Identify any non-permissible values of x, the equations of any asymptotes, and the domain.

Factor: $y = \dfrac{(x + 1)(x + 2)}{(x + 1)(x - 2)}$

There is a common factor $(x + 1)$, so there is a hole at: $x = -1$

There is a vertical asymptote with equation $x = 2$.

The function is: $y = \dfrac{x + 2}{x - 2}, x \neq -1$

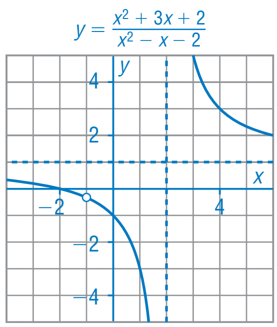
The y-coordinate of the hole is: $y = -\dfrac{1}{3}$

There is a horizontal asymptote. Both the leading coefficients are 1, so the horizontal asymptote has equation $y = 1$.

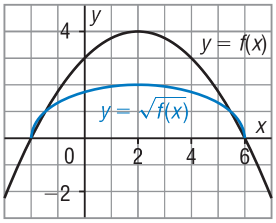
Choose other points and those close to the asymptotes:

x	4	6	1.99	2.01	−100	100
y	3	2	−399	401	0.96	1.04

Some of the y-values above are approximate.
The y-intercept is −1. The x-intercept is −2.
Plot points at the intercepts. Draw an open circle at the hole. Draw broken lines for the asymptotes, then sketch 2 smooth curves.
The domain is: $x \neq -1, x \neq 2$



4. **a)** The graph of $y = f(x)$ is given. On the same grid, sketch the graph of $y = \sqrt{f(x)}$.



Mark points where $y = 0$ or $y = 1$.
$y = \sqrt{f(x)}$ is not defined for $x < -2$ or $x > 6$.
Choose, then mark another point for $-2 \leq x \leq 6$.

x	$y = f(x)$	$y = \sqrt{f(x)}$
2	4	2

Join the points with a smooth curve.

b) Identify the domain and range of each function in part a, then explain why the domains are different and the ranges are different.

For $y = f(x)$, domain is: $x \in \mathbb{R}$; range is: $y \leq 4$
For $y = \sqrt{f(x)}$, domain is: $-2 \leq x \leq 6$; range is: $0 \leq y \leq 2$
The domains are different because $y = f(x)$ is defined for all real values of x while $y = \sqrt{f(x)}$ is only defined for values of x for which $f(x) \geq 0$.
The ranges are different because $f(x)$ can have any value less than or equal to 4, while $\sqrt{f(x)}$ can only be 0 or positive.

5. Use graphing technology to solve each equation. Give the solution to the nearest tenth.

a) $x - 5 = \sqrt{2x + 1}$

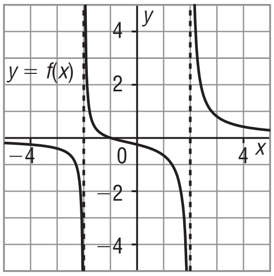
Graph a related function:
$f(x) = x - 5 - \sqrt{2x + 1}$
Use graphing technology to determine the zero: $x \doteq 9.5$

b) $\dfrac{x - 2}{2x + 1} + 2 = \dfrac{x + 1}{x + 3}$

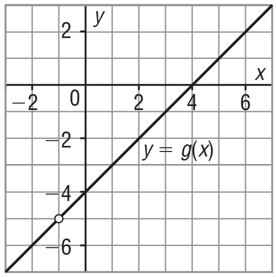
Graph a related function:
$f(x) = \dfrac{x - 2}{2x + 1} + 2 - \dfrac{x + 1}{x + 3}$
Use graphing technology to determine the zeros:
$x \doteq -4.1$ or $x \doteq 0.1$

6. Without using graphing technology, match each function to its graph. Justify your choice.

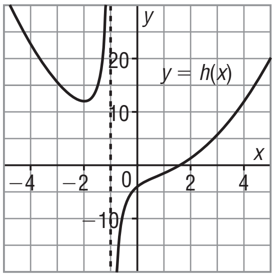
i) Graph A



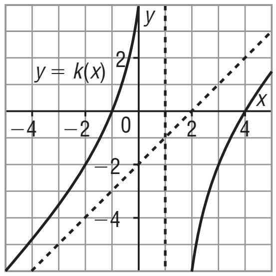
ii) Graph B



iii) Graph C



iv) Graph D



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

The function is undefined when $x^2 - 4 = 0$; that is, when $x = \pm 2$. There are no common factors so the graph has vertical asymptotes at $x = \pm 2$.
The function matches Graph A.

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

Factor: $y = \dfrac{(x - 4)(x + 1)}{x - 1}$

There are no common factors, so there is a vertical asymptote at $x = 1$. Since the degree of the numerator is 1 more than the degree of the denominator, there is an oblique asymptote.
The function matches Graph D.

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

Factor: $y = \dfrac{(x - 4)(x + 1)}{x + 1}$

$(x + 1)$ is a common factor, so there is a hole at $x = -1$. The function matches Graph B.

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

The function is undefined when $x = -1$. There are no common factors, so there is a vertical asymptote at $x = -1$.
The function matches Graph C.