Chapter 4 Radical and Rational Functions REVIEW

1. For a function defined by $y = -3\sqrt{2x+3}+5$,

(a) Use an algebraic process to determine the domain of the function.

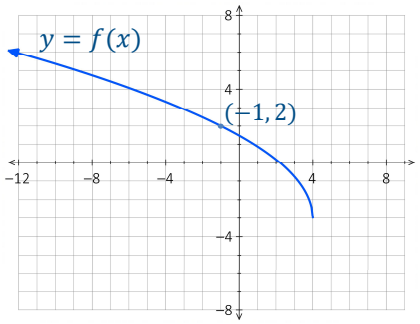
(b) State the range of the function. Describe which parameters of the equation are needed to determine the range.

(c) Use algebraic processes to determine the x and y-intercepts. *Exact values where applicable*

2. Exam Style **NR** A function has a domain $[-4/3, \infty)$, a range $[-3, \infty)$, and has an y-intercept $(0, 1)$. An equation of the function can be written in the form $y = a\sqrt{3x+b}-c$; $a, b, c \in I$.

The values of a, b, and c are, respectively, ____, ____, and ____.

3. The graph of $y = f(x)$ is shown on the right.



(a) Determine an equation for the function, in the form $y = \sqrt{b(x-h)}+k$ where $b, h, k \in I$.

(b) Use an algebraic process to determine the x and y-intercepts. *Exact values where applicable*

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4. Exam Style

The function $y = -a\sqrt{bx + c}$ has a domain:

A. $[-c, \infty)$

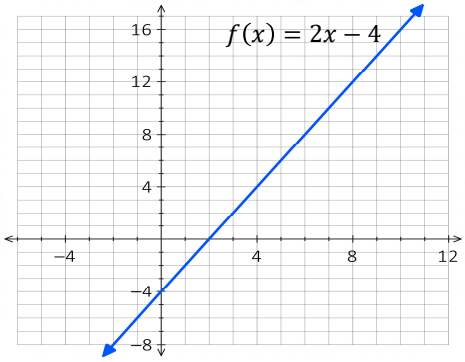
B. $[-c/b, \infty)$

C. $[-b, \infty)$

D. $[-b/c, \infty)$

5. For each given graph of $y = f(x)$, (i) sketch the graph of $y = \sqrt{f(x)}$, and use algebraic processes to determine the indicated graph characteristics. Label any invariant points and at least two other points on your graph.

(a) i



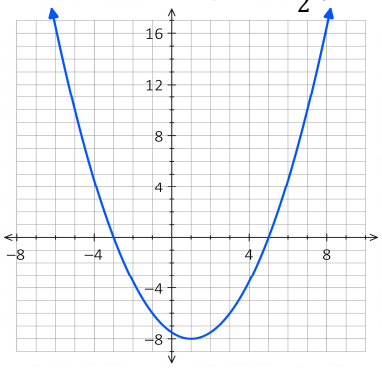
ii *Domain of* $y=\sqrt{f(x)}$

iii *Range* $y=\sqrt{f(x)}$

iv *Coords. of invariant pts:*

(b) i

$$f(x) = \frac{1}{2}(x-1)^2 - 8$$



ii *Domain of* $y=\sqrt{f(x)}$

iii *Range* $y=\sqrt{f(x)}$

iv *Coords. of invariant pts:*

Answers from previous page

1. (a) $[-\frac{3}{2}, \infty)$ (b) $(-\infty, 5]$ graph "opens down" since $a = -3$ is negative, basic graph of $y = \sqrt{x}$, which has a range $[0, \infty)$, is vertically translated 5 units up.

(c) *x*-int: $(-\frac{1}{9}, 0)$ *y*-int: $(0, -3\sqrt{3} + 5)$

2. 243 **3.** (a) $f(x) = \sqrt{-5(x-4)} - 3$ (b) *x*-int: $(11/5, 0)$ *y*-int: $(0, 2\sqrt{5})$

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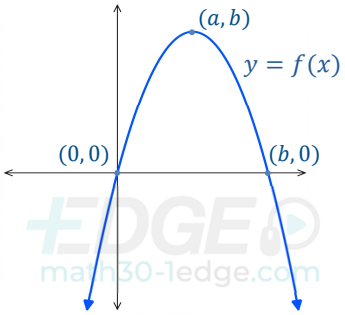
6. Given the function $f(x) = 2x^2 - 18$, use an algebraic process to determine the domain of $y = \sqrt{f(x)}$.

Use the following information to answer question 7

The graph of $y = f(x)$, shown on the right, is transformed to $y = \sqrt{f(x)}$.

The graph characteristics can be described using the codes, numbered 1 through 8, contained in the shaded box.

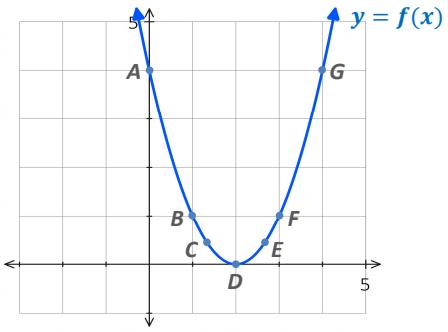


1	$[0, b]$	6	$[\sqrt{b}, \sqrt{a}]$
2	2	7	$[b, \sqrt{a}]$
3	$[0, \sqrt{a}]$	8	$[0, \infty)$
4	4	9	$[0, \sqrt{b}]$
5	$(-\infty, 0] \cup [b, \infty)$		

7. Exam Style **NR** In the transformation from $y = f(x)$ to $y = \sqrt{f(x)}$ there are ____ invariant points.
first digit

The graph of $y = \sqrt{f(x)}$ has a domain ____ and a range ____.
second digit third digit

8. Exam Style Given the graph of $y = f(x)$ on the right, the graph of $y = \sqrt{f(x)}$ will have invariant points at:



A. A, B, F, and G

B. B and F

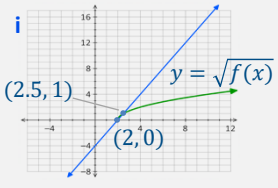
C. B, D, and F

D. B, C, D, E, and F

Answers from previous page

4. B

5. (a) **i**

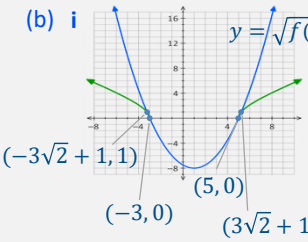


ii $[2, \infty)$

iii $[0, \infty)$

iv $(2, 0)$ and $(2.5, 1)$

(b) **i**



ii $\{x | x \leq -3 \text{ or } x \geq 5, x \in \mathbb{R}\}$

iii $\{y | y \geq 0, y \in \mathbb{R}\}$

iv $(-3\sqrt{2} + 1, 1)$, $(-3, 0)$, $(5, 0)$, and $(3\sqrt{2} + 1, 1)$

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9. For each of the following rational functions, state the indicated characteristics, using an algebraic process where appliable. Sketch each graph on the grid provided, fully labeling all key points and asymptotes.

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

i *Domain*

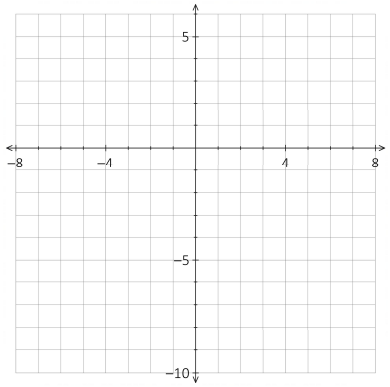
ii *V.A.*

iii x*-int:*

iv y*-int:*

v *H.A.*

vi *Range:*



(b) $y = \dfrac{3x+6}{4x-5}$

i *Domain*

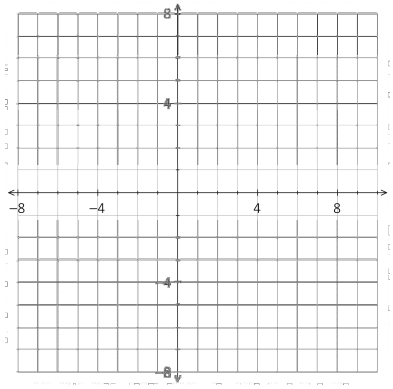
ii *V.A.*

iii x*-int:*

iv y*-int:*

v *H.A.*

vi *Range:*



(c) $y = -\dfrac{3}{2x^2-32}$

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i *Domain*

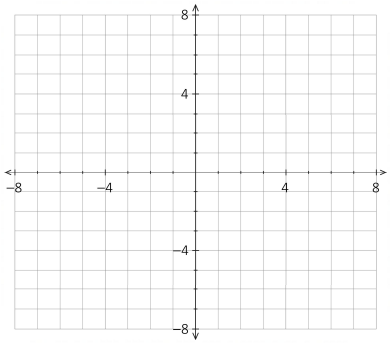
ii *V.A.*

iii x*-int:*

iv y*-int:*

v *H.A.*

vi *Range:*



Answers from previous page

6. $\{x | x \leq -3 \text{ or } x \geq 3, x \in \mathbb{R}\}$ **7.** 419 **8.** C

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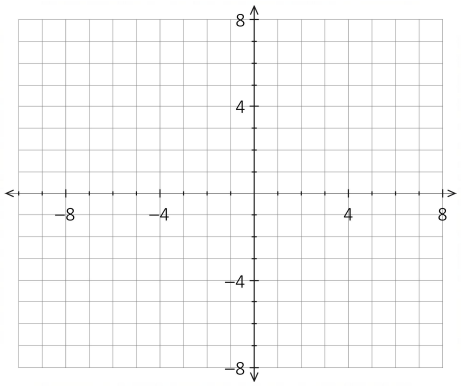
10. For each of the following rational functions, state the indicated characteristics, using an algebraic process where appliable. Sketch each graph on the grid provided, fully labeling all key points and asymptotes.

(a) $y = \dfrac{2x+3}{x^2+4x-5}$



i *Domain*

ii *V.A.*

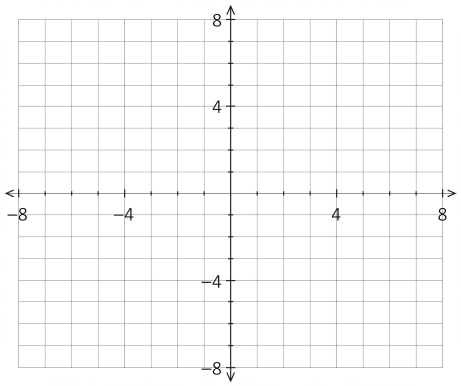
iii x*-int:*

iv y*-int:*

v *H.A.*

vi *Range:*

(b) $y = \dfrac{8x-32}{3x^2-7x-20}$



i *Domain*

ii *Graph at non-permissible value(s) (V.A. or P.D..)*

iii x*-int:*

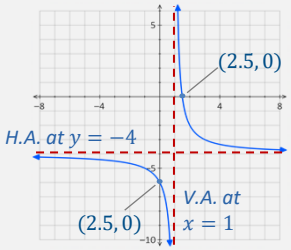
iv y*-int:*

v *H.A.*

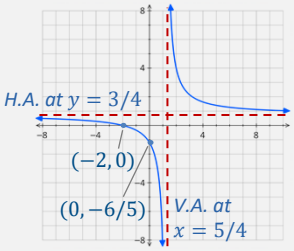
vi *Range:*

Answers from previous page

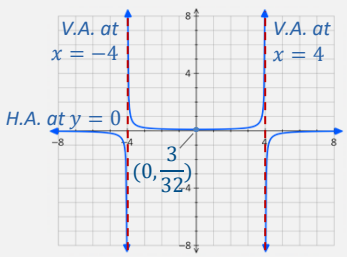
9. **(a)** i - $\{x|x \neq 1, x \in \mathbb{R}\}$
ii - **V.A.** at $x = 1$
iii - x-int: $(1.5, 0)$
iv - y-int: $(0, -6)$
iv - **H.A.** at $y = -4$
iv - $\{y|y \neq -4, y \in \mathbb{R}\}$



(b) i - $\{x|x \neq 5/4, x \in \mathbb{R}\}$
ii - **V.A.** at $x = 5/4$
iii - x-int: $(-2, 0)$
iv - y-int: $(0, -6/5)$
iv - **H.A.** at $y = 3/4$
iv - $\{y|y \neq 3/4, y \in \mathbb{R}\}$



(c) i - $\{x|x \neq \pm 4, x \in \mathbb{R}\}$
ii - **V.A.** at $x = \pm 4$
iii - x-int: n/a
iv - y-int: $(0, 3/32)$
iv - **H.A.** at $y = 0$
iv - $\{y|y \neq 0, y \in \mathbb{R}\}$



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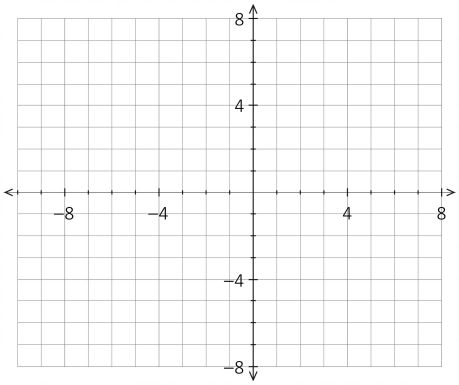
11. For each of the following rational functions, state the indicated characteristics, using an algebraic process where appliable. Sketch each graph on the grid provided, fully labeling all key points and asymptotes.

$$y = \frac{2x^2 + x - 15}{6x^2 - 13x - 5}$$



i *Domain*

ii *Graph at non-permissible value(s) (V.A. or P.D..)*

iii x*-int:*

iv y*-int:*

v *H.A.*

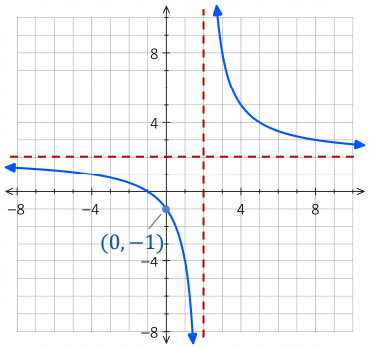
vi *Range:*

12. For the graphs of each of the following rational functions, any asymptotes or x-intercepts occur at integer values, unless otherwise indicated.

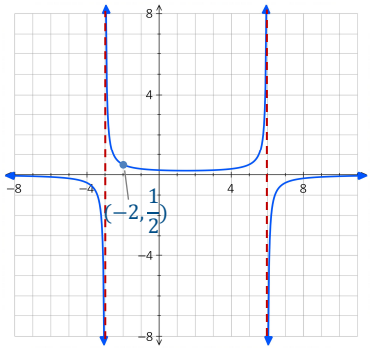
i - Determine an equation for each function, in factored form, and **ii** – in expanded form

iii – Determine the range of each function. *Use technology where necessary, round to the nearest hundredth.*

(a)



(b)



Answers from previous page

10. **(a)** i - $\{x | x \neq -5, x \neq 1, x \in \mathbb{R}\}$

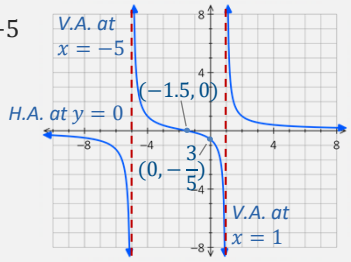
ii - **V.A.s** at $x = -5$ and $x = 1$

iii $(-1.5, 0)$

iv - $(0, -3/5)$

v - **H.A.** at $y = 0$

vi - $\{y \in \mathbb{R}\}$



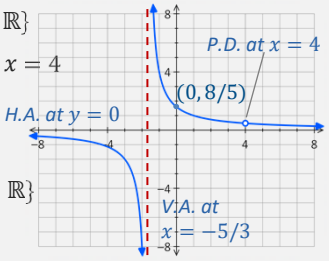
(b) i - $\{x | x \neq -5/3, x \neq 4, x \in \mathbb{R}\}$

ii - **V.A.** at $x = -5/3$, **P.D.** at $x = 4$

iii - n/a iv - $(0, 8/5)$

v - **H.A.** at $y = 0$

vi - $\{y | y \neq 0, y = 8/17, y \in \mathbb{R}\}$



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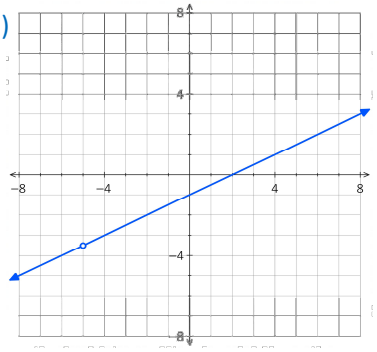
13. For the graphs of each of the following rational functions, any asymptotes or x-intercepts occur at integer values, unless otherwise indicated.

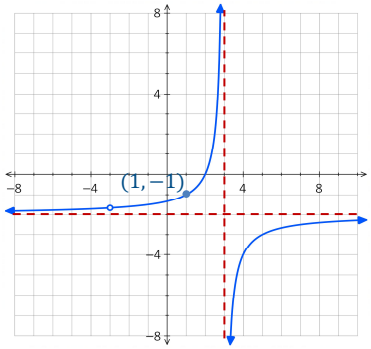
i - Determine an equation for each function, in factored form, and **ii** – in expanded form

iii – Determine the range of each function. *Use technology where necessary, round to the nearest hundredth.*

(a)



(b)



14. Exam Style

The graph of the function $f(x) = \dfrac{a(x-b)(x-2)}{3x^2-5x-2}$ where $a, b \in I$, has a horizontal asymptote at $y = 7/3$, an x-intercept at $(3, 0)$, a vertical asymptote at $x =$ _____ i and a range of _____ ii.

The above statement is true when the following substitutions are made for i and ii:

A. i $-1/3$ ii $\{y | y \neq -1, y \neq 7/3, y \in \mathbb{R}\}$

B. i $-1/3$ and 3 ii $\{y \neq 7/3, y \in \mathbb{R}\}$

C. i $-1/3$ ii $\{y \neq 7/3, y \in \mathbb{R}\}$

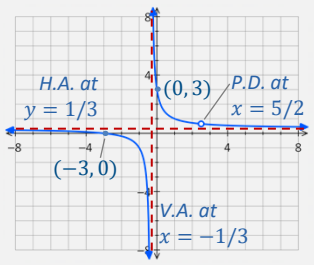
D. i $-1/3$ and 3 ii $\{y | y \neq -1, y \neq 7/3, y \in \mathbb{R}\}$

Answers from previous page ***and this page***

11. **i** - $\{x | x \neq -1/3, x \neq 5/2, x \in \mathbb{R}\}$ **v** - **H.A.** at $y = 1/3$

ii - **V.A.** at $x = -1/3$, **iii** - $(-3, 0)$ **vi** - $\{y | y \neq 1/17, y \neq 1/3, y \in \mathbb{R}\}$

P.D. at $x = 5/2$ **iv** - $(0, 3)$



12. **(a)** **i** - $y = \dfrac{2(x+1)}{x-2}$ **ii** - $y = \dfrac{2x+2}{x-2}$ **iii** - $\{y | y \neq 2, y \in \mathbb{R}\}$

(b) **i** - $y = \dfrac{-4}{(x+3)(x-6)}$ **ii** - $y = \dfrac{-4}{x^2-3x-18}$ **iii** - $\{y | y < 0$ or $y \geq 0.20, y \in \mathbb{R}\}$

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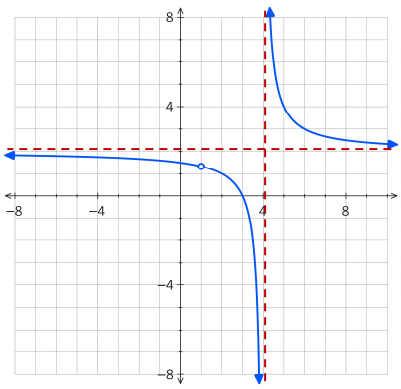
15. Exam Style **NR** The graph of $y = g(x)$ is shown on the right.



Its equation has the form:

$$g(x) = \frac{a(x-1)(x-b)}{x^2 - 5x + c} \quad \text{where } a, b \in I$$

The values of a, b and c in the above equation of $g(x)$ are, respectively, ____ , ____, and ____.

16. Exam Style **NR** A rational function $g(x) = \frac{2(x-5)(x+b)}{x-c}$ has a point of discontinuity at $(5, 14)$.

The value of b in the above equation for $y = g(x)$ is ____.

17. A function $y = f(x)$ is defined $f(x) = \frac{12x^2 - 31x + 20}{9x^2 - 27x + 20}$

The graph of $y = f(x)$ has a vertical asymptote at $x = \frac{a}{b}$ and a horizontal asymptote at $y = \frac{c}{d}$.

Exam Style **NR** The values of a, b, c and d are, respectively, ____, ____, ____, and ____.

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Answers from previous page ***and this page***

13. **(a)** i - $y = \frac{(x+5)(x-2)}{2(x+5)}$ ii - $y = \frac{x^2 + 3x - 10}{2x + 10}$ iii - $\{y | y \neq -7/2, y \in \mathbb{R}\}$

(b) i - $y = \frac{-2(x+3)(x-2)}{(x+3)(x-3)}$ ii - $y = \frac{-2x^2 - 2x + 12}{x^2 - 9}$ iii - $\{y | y \neq -2, y \neq -5/3, y \in \mathbb{R}\}$

14. **A**

15. 234 **16.** 2 **17.** 5343

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