ALBERTA DISTANCE LEARNING CENTRE
Mathematics 30-1
MAT3791
Workbook 3.2

Student's Questions and Comments

FOR STUDENT USE ONLY

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File Number: _____

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Summary

	Marks Earned	Total Marks	Percent
Practice 3.2A	**I have ____ /8 and ____%**		
Practice 3.2B	**I have ____ /8 and ____%**		
Practice 3.2C	**I have ____ /8 and ____%**		
Practice 3.2D	**I have ____ /8 and ____%**		
Explore Your Understanding 3.2			

Teacher's Comments:

Teacher's Signature

REVISED MAY 2019

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MAT3791
Mathematics 30-1
ISBN: 978-1-927090-09-1
Workbook 3.2

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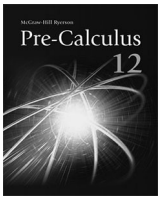

Pre-Calculus 12
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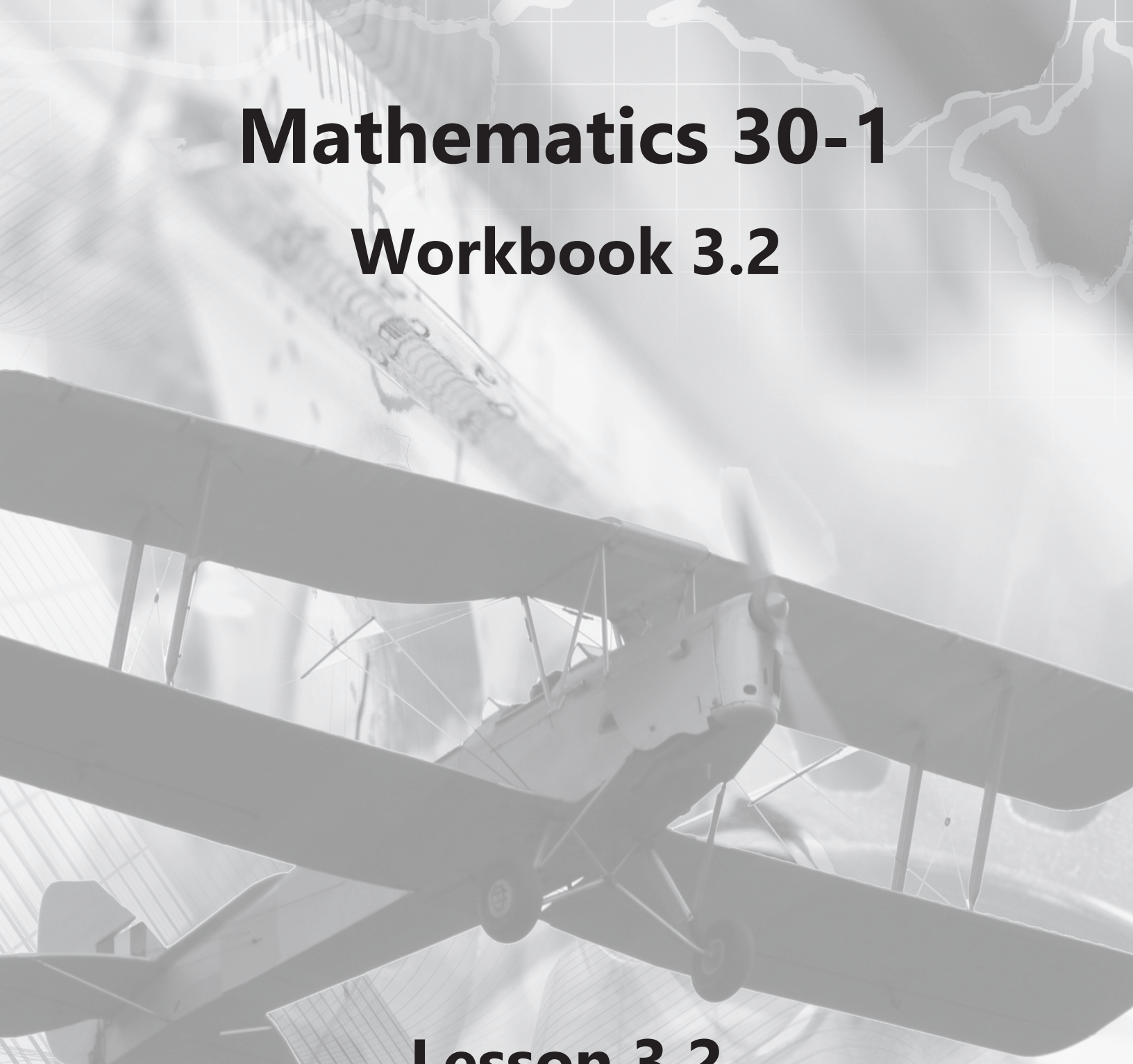
Mathematics 30-1

Workbook 3.2



Lesson 3.2
Transforming Radical, Sinusoidal, Exponential and Rational Functions

Instructions for Submitting Workbooks

1. Submit Workbooks **regularly** for assessment.

2. Submit only **one Workbook at a time.** This allows your teacher to provide feedback that you can apply to subsequent course work and exams.

3. Check that your **Workbook is complete.** Your Workbook will be returned as **incomplete** if a reasonable attempt with relevant work has not been made. Therefore, **do not leave any questions blank.** Contact your teacher for help **prior** to submitting this Workbook.

4. Attach the correct address label or complete the Workbook coversheet.

5. Submission Methods:

Postal Mail – Mail the completed Workbook to an Alberta Distance Learning Centre office. Ensure that you attach sufficient postage by having the envelope weighed at the post office.

Electronically – Scan the completed Workbook. Save the file to your computer as **Math 30-1 Workbook# FirstInitial LastName.** Then, upload the file.

Fax – Fax the completed Workbook to Alberta Distance Learning Centre.

In Person – Drop the completed Workbook at the Alberta Distance Learning Centre office in Barrhead. The address is listed below.

Barrhead
4601 - 63 Avenue
Barrhead, Alberta T7N 1P4
Phone 780-674-5333
Toll-free 1-866-774-5333
Fax 780-674-7593

Mathematics 30-1

Workbook 3.2

Our Pledge to You:

Enrolling in this course is another step toward an Alberta High School Diploma. Everyone at Alberta Distance Learning Centre is committed to helping students achieve their educational goals. We welcome your contact in person or by phone, fax, e-mail, voice mail, or postal mail.

Advice:

Your achievement in this course is determined by your success in the assessments of each unit. Your responses to assignments indicate your understanding of outcomes established by Alberta Education.

- Before responding to the assigned questions, read all relevant directions for the Workbook and instruction in the course materials, including the appropriate Guide for Learning and any other resources provided.
- When you encounter difficulties, re-read the directions for the Workbook and review the relevant instruction in the Guide for Learning.
- If you require further clarification, contact your Alberta Distance Learning Centre teacher for assistance.

Notice:

You have one opportunity to submit each Workbook.

- Only under exceptional circumstances will your ADLC teacher re-assess your work. Therefore, apply significant effort to each Workbook.
- If your final exam mark is vastly different from your Quiz marks, your teacher may apply discretion in determining your course mark.

ADLC Plagiarism Policy (ADLC Administrative Policy 60–1)

Program integrity and academic honesty are very important at ADLC. When students are successful in ADLC courses, we want full confidence that they have clearly met the intended program outcomes.

Plagiarism is the practice of representing someone else's work or ideas as one's own. It is an academically dishonest practice and is detrimental to a student's knowledge & skill development.

ADLC takes a progressive approach to plagiarism to educate and correct the behaviour. If a student is currently enrolled in any ADLC course and found to have plagiarized work, the following steps are taken:

Warning: ADLC Teachers decide if a warning happens instead of calling the first instance. The warning is recorded in SIS Communications.

First Instance	Second Instance	Third Instance
Students are assigned a mark of zero and a chance to redo the question or the assignment. It is up to the ADLC teacher's discretion whether or not to assign a mark of zero on the plagiarized question or on the entire assignment. ADLC teachers record a SIS Communication and a 'Student Note'.	The student is assigned a mark of zero with no chance to redo the question or the assignment. It is up to the ADLC teacher's discretion whether or not to assign a mark of zero on the plagiarized question or on the entire assignment. The ADLC Principal, or designate, is notified and the instance is recorded in SIS Communications.	Student is removed from the course in which the third instance occurred. The ADLC Principal, or designate, is notified and the instance is recorded in SIS Communications.

Important

While removal from a course is limited to the course in which the Third Instance has occurred, the preceding steps can occur across different courses. A student who has been found plagiarizing in Course A and held to the First Instance consequences who then plagiarizes in Course B will move to the Second Instance consequences.

Further Instances

After the Third Instance, any further instances of plagiarism in any course will result in immediate removal from that course. Ongoing occurrences may result in removal from all courses and barring of registration with ADLC.

Clean Slate

Students earn a clean slate after one calendar year passes with no instances.

Sharing of ADLC Work (ADLC Administrative Policy 60–4)

Plagiarism is the practice of representing someone else's work or ideas as one's own. It is a dishonest practice and is damaging to a student's knowledge & skill development. Plagiarism is addressed in ADLC Administrative Policy 60-01.

The sharing of school work, especially after having been marked by ADLC, to students for the purposes of submitting plagiarized work (either paraphrasing or directly copying student work) is dishonest, and this sharing goes against the Alberta School Act's expectation of students to respect school rules and co-operate with how schools offer education to their students.

ADLC prefers to take a progressive approach to sharing of work with other students, in order to educate and correct the behaviour.

If a student is currently enrolled in any ADLC course and found to be sharing school work, whether from their current course or another, to others:

First Incidence	Second Incidence
The student is informed that their work has been submitted as plagiarized work by another student; a warning is provided that further submissions of such work, from any course, will be grounds for removal from the current course(s).	The student is removed from all active ADLC courses.

If the student is not currently enrolled in any ADLC course and found to be sharing school work with others, they are informed that their work has been submitted as plagiarized work by another student and, as such, further registrations in any ADLC course will not be permitted. The incident will be recorded on the student's file.

Such actions do not limit ADLC to pursue other remedies (actions), either criminal or civil, for the distribution of its copyrighted materials.

Practice Assessment

Practice provides practice and allows you to self-reflect on your conceptual understanding of the Lesson skills. You will mark your work for *Practice* in each *Workbook* according to the following rubric.

Category	Strategy and Procedures	Response to Questions
	I have…	*I have…*
4	• used efficient and effective strategies to solve the problem(s)	• provided detailed explanations and followed directions appropriately to complete all questions
3	• used effective strategies to solve the problem(s)	• provided clear explanations and followed directions adequately to complete most questions
2	• used effective strategies inconsistently to solve the problem(s)	• provided incomplete explanations and followed some directions to complete a few questions
1	• used ineffective strategies to solve the problem(s)	• provided incomplete explanations and have not followed directions to complete some questions

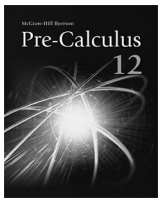
Complete *Practice* exercises using your best work, showing all relevant steps needed to arrive at your solution. Refer to the *Module* to review lesson instructions. Contact your teacher for assistance or clarification as needed, or to investigate the topic further.

Check and correct your work using the solutions provided in *Appendix* in the *Module*.

Practice is worth 8 marks; your mark can help you gauge your understanding of *Lesson* material.

After you have assessed your work, reflect on your understanding of the concepts addressed in the *Practice* exercises in the table provided.

Practice 3.2A



Now, try what you have learned so far. Turn to pages 72 to 74 in *Pre-Calculus 12* and do questions 2a to 2d, 4a to 4d, 5b, 5d, 5f, 6a to 6d, 10a, 10d, and 12a to 12d.

You may check your practice work by turning to the *Appendix* section of the *Module.*

Questions 2a to 2d, page 72

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Questions 4a to 4d, page 73

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Questions 5b, 5d, and 5f, page 73

b.

My solution	My corrections if needed

d.

My solution	My corrections if needed

f.

My solution	My corrections if needed

Questions 6a to 6d, page 73

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Questions 10a and 10d, page 74

a.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Questions 12a to 12d, page 74

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Turn to *Practice 3.2A Solutions* in the *Appendix* in *Unit 3*. Use the solutions to check your work and make corrections. Next, use the Practice Assessment rubric found on page 1 to give yourself a grade. **Record your grade on the cover of this booklet.** When complete, continue in the *Module*.

Unit 3: Transformations

Practice 3.2A Solutions Appendix

Use these solutions to correct your work. When finished, give yourself a grade using the *Practice Assessment* rubric found in *Workbook 3.2*.

Pages 72 to 74, questions 2a to 2d, 4a to 4d, 5b, 5d, 9f, 6a to 6d, 10a, 10d, and 12a to 12d.

Questions 2a to 2d, page 72

a. Vertical stretch by a factor of 7
Horizontal translation 9 units to the right
Domain: $\{x \mid x \geq 9, x \in R\}$
Range: $\{y \mid y \geq 0, y \in R\}$

b. Reflection in the y-axis
Vertical translation 8 units up
Domain: $\{x \mid x \leq 0, x \in R\}$
Range: $\{y \mid y \geq 8, y \in R\}$

c. Reflection in the x-axis
Horizontal stretch by a factor of 5
Domain: $\{x \mid x \geq 0, x \in R\}$
Range: $\{y \mid y \leq 0, y \in R\}$

d. Vertical stretch by a factor of $\frac{1}{2}$
Horizontal translation 6 units to the left
Vertical translation 4 units down
Domain: $\{x \mid x \geq -6, x \in R\}$
Range: $\{y \mid y \geq -4, y \in R\}$

Additional Notes:

a. Refer to $y = af[b(x - h)] + k$ to help determine the transformations.

$a = 7$
$b = 1$
$h = 9$
$k = 0$

Because $a = 7$, there is a vertical stretch by a factor of 7. All the y-values will be multiplied by 7.

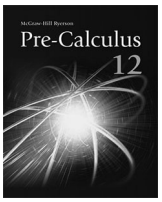
Because $h = 9$, there is a horizontal shift to the right 9 units.

The domain of $y = \sqrt{x}$ is affected by the horizontal translation. The vertical stretch does not affect the range.

ADLC Mathematics 30-1

111

Practice 3.2B



Now, try what you have learned so far. Turn to pages 250 to 254 in *Pre-Calculus 12* and do questions 1c, 2a, 3a part ii, 4a to 4e, 5a to 5d, 7a, 9, and 24a to 24e.

You may check your practice work by turning to the *Appendix* section of the *Module.*

Questions 1c, page 250

c.

My solution	My corrections if needed

Question 2a, page 250

a.

My solution	My corrections if needed

Question 3a, Part ii, page 250

a.

My solution	My corrections if needed

Questions 4a to 4e, page 250

My solution	My corrections if needed

Questions 5a to 5d, page 250

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Question 7a, page 251

a.

My solution	My corrections if needed

Question 9, page 251

My solution	My corrections if needed

Questions 24a to 24e, page 254

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

c.

My solution	My corrections if needed

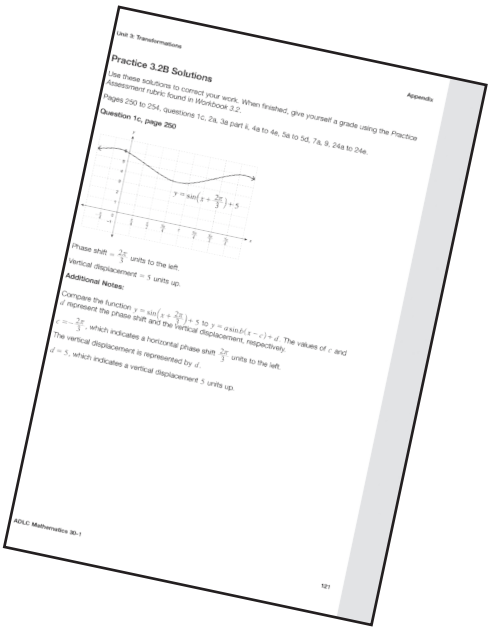
d.

My solution	My corrections if needed

e.

My solution	My corrections if needed

Turn to *Practice 3.2B Solutions* in the *Appendix* in *Unit 3*. Use the solutions to check your work and make corrections. Next, use the Practice Assessment rubric found on page 1 to give yourself a grade. **Record your grade on the cover of this booklet.** When complete, continue in the *Module*.



Unit 3: Transformations

Practice 3.2B Solutions

Appendix

Use these solutions to correct your work. When finished, give yourself a grade using the Practice Assessment rubric found in *Workbook 3.2*.

Pages 250 to 254, questions 1c, 2a, 3a part ii, 4a to 4e, 5a to 5d, 7a, 9, 24a to 24e.

Question 1c, page 250

Phase shift $= \frac{2\pi}{3}$ units to the left.

Vertical displacement $= 5$ units up.

Additional Notes:

Compare the function $y = \sin\left(x + \frac{2\pi}{3}\right) + 5$ to $y = a\sin b(x - c) + d$. The values of c and d represent the phase shift and the vertical displacement, respectively.

$c = -\frac{2\pi}{3}$, which indicates a horizontal phase shift $\frac{2\pi}{3}$ units to the left.

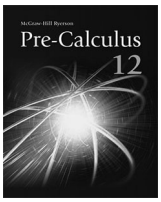
The vertical displacement is represented by d.

$d = 5$, which indicates a vertical displacement 5 units up.

ADLC Mathematics 30-1

121

Practice 3.2C



Now, try what you have learned so far. Turn to pages 354 to 356 in *Pre-Calculus 12* and do questions 1a to 1d, 3e, 4a to 4d, and 9a to 9d.

You may check your practice work by turning to the *Appendix* section of the *Module.*

Questions 1a to 1d, page 354

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Question 3e, page 354

My solution	My corrections if needed

Questions 4a to 4d, page 355

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Questions 9a to 9d, page 356

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

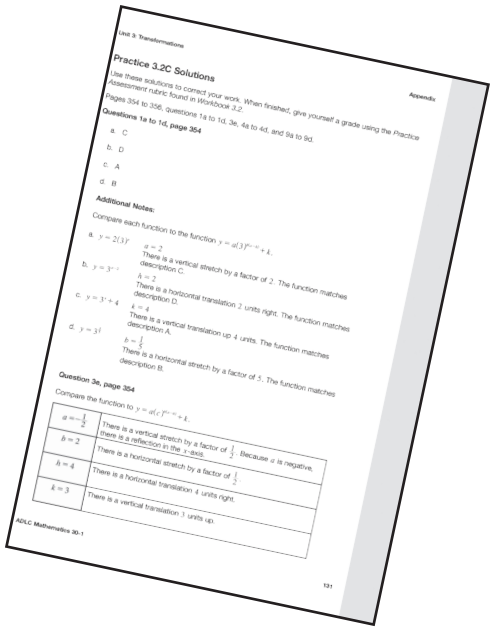
c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Turn to *Practice 3.2C Solutions* in the *Appendix* in *Unit 3*. Use the solutions to check your work and make corrections. Next, use the Practice Assessment rubric found on page 1 to give yourself a grade. **Record your grade on the cover of this booklet.** When complete, continue in the *Module*.



Unit 3: Transformations

Practice 3.2C Solutions Appendix

Use these solutions to correct your work. When finished, give yourself a grade using the *Practice Assessment* rubric found in *Workbook 3.2*.

Pages 354 to 356, questions 1a to 1d, 3e, 4a to 4d, and 9a to 9d.

Questions 1a to 1d, page 354

a. C

b. D

c. A

d. B

Additional Notes:

Compare each function to the function $y = a(3)^{x-c} + k$.

a. $y = 2(3)^x$ $a = 2$
There is a vertical stretch by a factor of 2. The function matches description C.

b. $y = 3^{x-2}$ $h = 2$
There is a horizontal translation 2 units right. The function matches description D.

c. $y = 3^x + 4$ $k = 4$
There is a vertical translation up 4 units. The function matches description A.

d. $y = 3^{\frac{1}{5}x}$ $b = \frac{1}{5}$
There is a horizontal stretch by a factor of 5. The function matches description B.

Question 3e, page 354

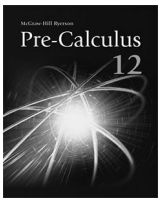
Compare the function to $y = a(c)^{x-c} + k$.

$a = -\frac{1}{2}$	There is a vertical stretch by a factor of $\frac{1}{2}$. Because a is negative, there is a reflection in the x-axis.
$b = 2$	There is a horizontal stretch by a factor of $\frac{1}{2}$.
$h = 4$	There is a horizontal translation 4 units right.
$k = 3$	There is a vertical translation 3 units up.

ADLC Mathematics 30-1

131

Practice 3.2D



Now, try what you have learned so far. Turn to pages 442 to 443 in *Pre-Calculus 12* and do questions 2a to 2d, 3c, 3d, 4a, 5c, 7c, 8a, and 8b.

You may check your practice work by turning to the *Appendix* section of the *Module.*

Questions 2a to 2d page 442

a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Questions 3c and 3d, page 442

c.

My solution	My corrections if needed

d.

My solution	My corrections if needed

Question 4a, page 442

a.

My solution	My corrections if needed

Question 5c, page 442

c.

My solution	My corrections if needed

Question 7c, page 443

c.

My solution	My corrections if needed

Questions 8a and 8b, page 443

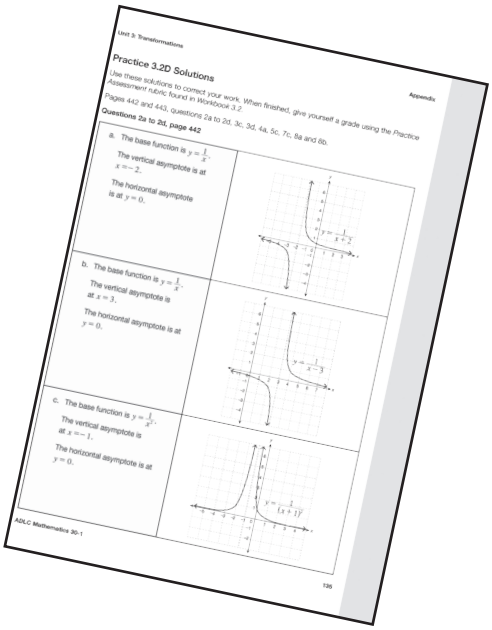
a.

My solution	My corrections if needed

b.

My solution	My corrections if needed

Turn to *Practice 3.2D Solutions* in the *Appendix* in *Unit 3*. Use the solutions to check your work and make corrections. Next, use the Practice Assessment rubric found on page 1 to give yourself a grade. **Record your grade on the cover of this booklet.** When complete, continue to *Explore Your Understanding Assignment 3.2.*


Unit 3: Transformations

Practice 3.2D Solutions

Appendix

Use these solutions to correct your work. When finished, give yourself a grade using the Practice Assessment rubric found in Workbook 3.2.

Pages 442 and 443, questions 2a to 2d, 3c, 3d, 4a, 5c, 7c, 8a and 8b.

Questions 2a to 2d, page 442

a. The base function is $y = \frac{1}{x}$.

The vertical asymptote is at $x = -2$.

The horizontal asymptote is at $y = 0$.

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

b. The base function is $y = \frac{1}{x}$.

The vertical asymptote is at $x = 3$.

The horizontal asymptote is at $y = 0$.

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

c. The base function is $y = \frac{1}{x^2}$.

The vertical asymptote is at $x = -1$.

The horizontal asymptote is at $y = 0$.

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

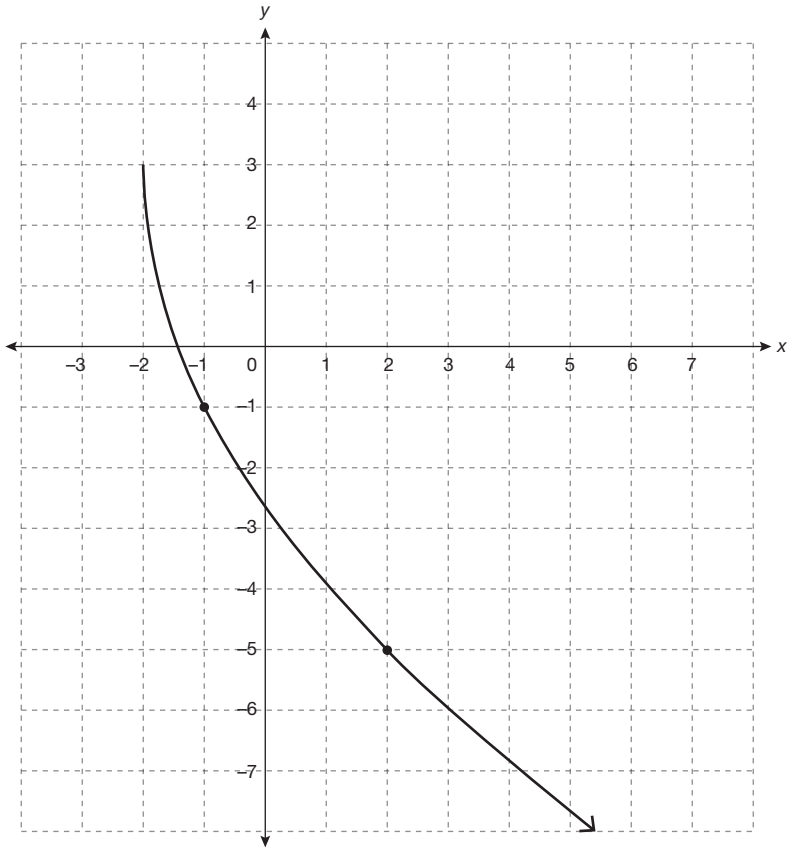
ADLC Mathematics 30-1

136

Explore Your Understanding Assignment 3.2

This assignment includes 20 marks. You are expected to complete **17 marks** worth of work. If you complete more than this, all completed questions will be used to assign a grade. For example, if you complete all 20 marks worth of work, your assignment total will be 20 instead of 17. You can also complete a question and label it "DO NOT MARK" if you are not confident in your work. Your teacher will then give feedback on your response, which will help clarify any misconceptions, but will not count it towards your required mark total. Please contact your teacher if you have any questions.

1. The graph of the function $y = a\sqrt{b(x-h)} + k$ is shown.



(2) a. Determine the equation of this function if it was produced from $y = \sqrt{x}$ using a vertical stretch and not a horizontal stretch.

(1) b. Determine the domain and range of this function.

(2) c. Determine the equation of this function if it was produced from $y = \sqrt{x}$ using a horizontal stretch and not a vertical stretch.

2. The graph of a sinusoidal function passes through $(0, 1)$, has a maximum point at $\left(\frac{\pi}{2}, 3\right)$, and a subsequent maximum point at $\left(\frac{7\pi}{6}, 3\right)$.

(2) a. Determine the amplitude, period, midline, and range of this function.
[Hint: Determine the period, and show the point $(0, 1)$ is $\frac{3}{4}$ of a period to the left of the point $\left(\frac{\pi}{2}, 3\right)$. Why does this guarantee $(0, 1)$ is on the midline?]

(1) b. Determine a sine function with these characteristics.

(1) c. Determine a cosine function with these characteristics.

(3) 3. The High Roller Ferris wheel was completed in 2014 in Las Vegas. It is the largest in the world, with a height of 550 ft and a 520 ft diameter. Riders enter a cabin at the bottom of the wheel and are taken on a rotation that lasts 30 min.

Write a sine function that models the height of a cabin for the duration of the ride.

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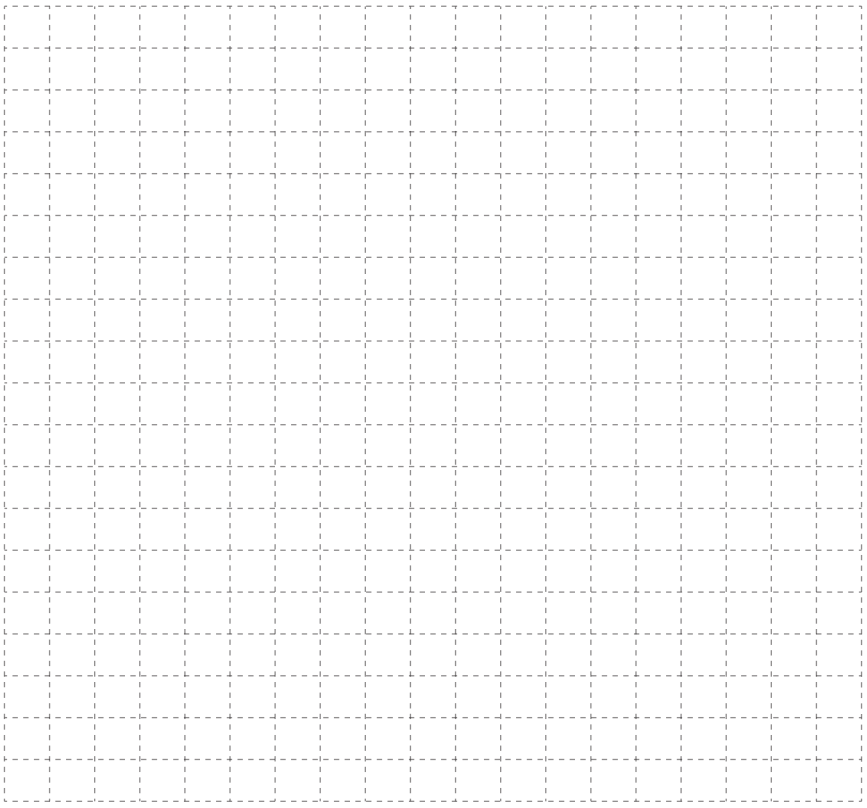
(1) 4. a. Explain how to graph $f(x) = \frac{4}{x-5} + 3$ using transformations.

(1) b. Sketch the graph of $y = f(x)$.

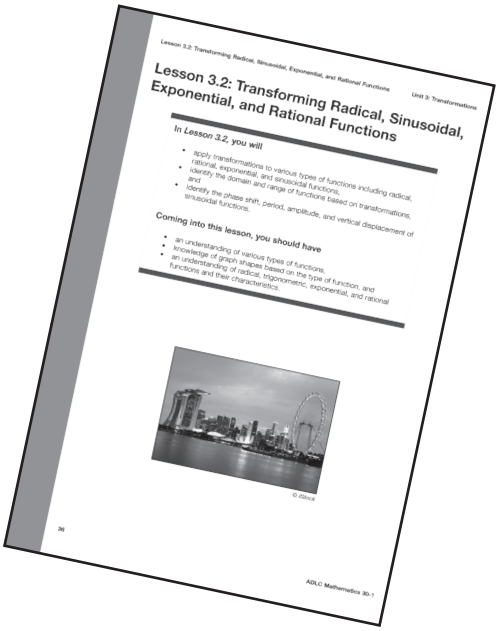


(2) c. State the domain, range, asymptotes, and intercepts of the graph of $y = f(x)$.

(4) 5. Suppose, after entering the body, a substance is eliminated at a rate that can be modelled by the function $C = \left(\frac{1}{2}\right)^t$, where C is the concentration and t is time. Transform this function to match each of the following scenarios. [Hint: Only one transformation is required in each case.]

Description	Transformed Equation	Description of Transformation
The initial concentration of the substance is tripled.		
The substance is eliminated at one quarter of the original rate.		
A second substance delays all elimination of the first substance for 4 units of time.		
Instead of reducing the concentration of the substance toward 0, the body reduces the concentration of the substance toward 20 units.		

When this workbook is complete, submit it using a method described at the beginning of this *Workbook*. Next, complete *Test Your Understanding Quiz 3.1* online in Moodle. When complete, return to the Module and begin *Lesson 3.2*.


Lesson 3.2: Transforming Radical, Sinusoidal, Exponential, and Rational Functions

Unit 3: Transformations

Lesson 3.2: Transforming Radical, Sinusoidal, Exponential, and Rational Functions

In *Lesson 3.2*, you will

- apply transformations to various types of functions including radical, rational, exponential, and sinusoidal functions;
- identify the domain and range of functions based on transformations; and
- identify the phase shift, period, amplitude, and vertical displacement of sinusoidal functions.

Coming into this lesson, you should have

- an understanding of various types of functions,
- knowledge of graph shapes based on the type of function, and
- an understanding of radical, trigonometric, exponential, and rational functions and their characteristics.

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