

## Lesson 12 – Course Review

In this lesson, we will review the topics and applications from Lessons 1-11. We will begin with a review of the different types of functions, and then apply each of them to a set of application problems. If you have forgotten how to work a particular type of problem, refer back to the corresponding Mini-Lesson for assistance.

### Lesson Topics:

#### Section 12.1 Overview of Functions

- Linear, Exponential, Logarithmic, Quadratic, Rational, and Radical Functions
- Identify basic characteristics and graph

#### Section 12.2 Solving Equations

- Graphically
- Algebraically

#### Section 12.3 Mixed Applications

### Lesson 12 Checklist

Component	Required? Y or N	Comments	Due	Score
Mini-Lesson				
Online Homework				
Online Quiz				
Online Test				
Practice Problems				
Lesson Assessment				

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Mini-Lesson 12

### Section 12.1 – Overview of Functions

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<b>Problem 1</b>	<b>YOU TRY – Linear Functions</b>
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Complete the table. Write intercepts as ordered pairs. Use inequality notation for domain and range. Round to the nearest hundredth as needed. Write “N” if the answer does not exist.

	$f(x) = \frac{2}{3}x - 6$	$g(x) = -4x$	$h(x) = 103$
Behavior (Increasing, Decreasing, Horizontal, or Vertical)			
Slope			
Vertical Intercept			
Horizontal Intercept			
Domain			
Range			
Sketch the Graph on an appropriate viewing window. Label all intercepts and interesting features of the graph.			

<b>Problem 2</b>	<b>YOU TRY – Exponential Functions</b>
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Complete the table. Write intercepts as ordered pairs. Use inequality notation for domain and range. Round to the nearest hundredth as needed. Write “N” if the answer does not exist.

	$f(x) = 82(0.932)^x$	$g(x) = 512(1.36)^x$
Growth or Decay?		
Growth / Decay Rate (as a %)		
Vertical Intercept		
Horizontal Intercept		
Asymptote (equation)		
Domain		
Range		
Sketch the Graph on an appropriate viewing window. Label all intercepts and interesting features of the graph.		

**Problem 3** | **YOU TRY – Quadratic Functions**

Complete the table. Write intercepts and the vertex as ordered pairs. Use inequality notation for domain and range. Round to the nearest hundredth as needed. Write “N” if the answer does not exist.

	$f(x) = x^2 - 8x + 12$	$h(x) = -2x^2 - 31$
Opens Upward or Downward?		
Vertex		
Vertical Intercept		
Horizontal Intercept(s)		
Domain		
Range		
Sketch the Graph on an appropriate viewing window. The vertex and intercepts must appear on the screen.		

**Problem 4** | **YOU TRY – Logarithmic Functions**

Complete the table. Write intercepts as ordered pairs. Use inequality notation for domain and range. Round to the nearest hundredth as needed. Write “N” if the answer does not exist.

	$f(x) = \log_2 x$
Vertical Intercept	
Horizontal Intercept	
Domain	
Range	
Vertical Asymptote	
Determine $f(32)$	
Sketch the Graph Use viewing window Xmin = 0 Xmax = 10 Ymin = -5 Ymax = 5	

**Problem 5** | **YOU TRY – Radical Functions**

Complete the table. Write intercepts as ordered pairs. Where applicable, give *both* the exact answer *and* the decimal approximation rounded to the nearest hundredth. Write “N” if the answer does not exist.

	$f(x) = \sqrt[3]{4x + 9}$	$f(x) = \sqrt[4]{x - 16}$	$f(x) = \sqrt{8 - 2x}$
Vertical Intercept			
Horizontal Intercept			
Domain			
Determine $f(5)$			
Determine $x$ when $f(x) = 5$			
Sketch the Graph on an appropriate viewing window. Label all intercepts and interesting features of the graph.			

<b>Problem 6</b>	<b>YOU TRY –Rational Functions</b>
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Complete the table. Write intercepts as ordered pairs. Use inequality notation for domain and range. Round to the nearest hundredth as needed.

	$f(x) = \frac{4}{3x}$	$f(x) = \frac{4x - 6}{5 - x}$
Vertical Intercept		
Horizontal Intercept		
Domain		
Vertical Asymptote (equation)		
Horizontal Asymptote (equation)		
Determine $f(8)$		
Sketch the Graph on an appropriate viewing window. Label all intercepts and interesting features of the graph.		



## Section 12.2 – Solving Equations

**Problem 7**    **YOU TRY – Solving Equations by Graphing**

In each situation below, you will need to graph to find the solution to the equation using the INTERSECTION method described in this lesson. Fill in the missing information for each situation. Include a rough but accurate sketch of the graphs and intersection point. Mark and label the intersection. Round answers to two decimal places.

a) Solve  $3x^2 - 6x + 1 = 5$                       Solutions:  $x =$  \_\_\_\_\_,  $x =$  \_\_\_\_\_

Xmin: \_\_\_\_\_

Xmax: \_\_\_\_\_

Ymin: \_\_\_\_\_

Ymax: \_\_\_\_\_

b) Solve  $85(1.08)^x = 289$                       Solution:  $x =$  \_\_\_\_\_

Xmin: \_\_\_\_\_

Xmax: \_\_\_\_\_

Ymin: \_\_\_\_\_

Ymax: \_\_\_\_\_

c) Solve  $2 + \sqrt{x+5} = 9$                       Solution:  $x =$  \_\_\_\_\_

Xmin: \_\_\_\_\_

Xmax: \_\_\_\_\_

Ymin: \_\_\_\_\_

Ymax: \_\_\_\_\_

**Problem 8** | **YOU TRY – Solving Equations Algebraically**

Solve the equations below *algebraically* showing all steps. Where applicable, give *both* the exact answer and the decimal approximation rounded to the nearest hundredth.

a) Solve  $3x^2 - 6x + 1 = 5$

b) Solve  $85(1.08)^x = 289$

c) Solve  $2 + \sqrt{x+5} = 9$

d) Solve  $3 + 2\log_5(x-4) = 4$

e) Solve  $\frac{2x-7}{x+1} = 3$

f) Solve  $\log(x+1) = 3$

Section 12.3 – Mixed Applications

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<b>Problem 9</b>	<b>YOU TRY – Mixed Applications</b>
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A toy rocket is shot straight up into the air. The function  $H(t) = -16t^2 + 128t + 3$  gives the height (in feet) of a rocket after  $t$  seconds. Round answers to two decimal places as needed. All answers must include appropriate units of measure.

- How long does it take for the rocket to reach its maximum height? Write your answer in a complete sentence.
- What is the maximum height of the rocket? Write your answer in a complete sentence.
- How long does it take for the rocket to hit the ground? Write your answer in a complete sentence.
- Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.
- Determine the practical domain of  $H(t)$ . Use inequality notation and include units.
- Determine the practical range of  $H(t)$ . Use inequality notation and include units.

<b>Problem 10</b>	<b>YOU TRY – Mixed Applications</b>
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The function  $E(t) = 3861 - 77.2t$  gives the surface elevation (in feet above sea level) of Lake Powell  $t$  years after 1999. All answers must indicate the appropriate *year*.

- a) Determine the surface elevation of Lake Powell in the year 2001. Show your work, and write your answer in a complete sentence. Round your answer to the nearest whole number.
- b) Determine  $E(5)$ , and write a sentence explaining the meaning of your answer. Round your answer to the nearest whole number.
- c) Identify the vertical intercept of this linear function. Write it as an ordered pair, then write a sentence explaining its meaning in this situation.
- d) Identify the slope of this linear function and explain its meaning in this situation. Answer in a complete sentence and include all appropriate units.
- e) This function accurately models the surface elevation of Lake Powell from 1999 to 2005. Determine the practical range of this linear function. Use proper inequality notation and **include units**. Round to the nearest whole number.

**Problem 11** | **YOU TRY – Mixed Applications**

One 12-oz can of Diet Pepsi contains about 36 mg of caffeine. The body metabolizes caffeine at a rate of about 14% per hour. Answer in complete sentences.

- a) Write a formula for the amount,  $A$ , of caffeine remaining in the body  $x$  hours after drinking one can of Diet Pepsi. Your answer must be written in function notation.
  
  
  
  
  
  
  
  
  
  
- b) Determine  $A(3)$ . Round your answer to two decimal places, and write a sentence explaining its meaning.
  
  
  
  
  
  
  
  
  
  
- c) For what value of  $x$  is  $A(x) = 3$ ? Round your answer to two decimal places, and write a sentence explaining its meaning.
  
  
  
  
  
  
  
  
  
  
- d) How much caffeine is in the body one day after drinking one can of Diet Pepsi? Show all of your work and write your answer in a complete sentence. Round your answer to two decimal places as needed.
  
  
  
  
  
  
  
  
  
  
- e) How long will it take the body to metabolize half of the caffeine from one can Diet Pepsi? Show all of your work and write your answer in a complete sentence. Round your answer to two decimal places as needed.
  
  
  
  
  
  
  
  
  
  
- f) According to this model, how long will it take for *all* of the caffeine to leave the body?

**Problem 12** | **YOU TRY – Mixed Applications**

You and your family are heading out to San Diego on a road trip. From Phoenix, the trip is 355 miles according to Google. Answer the following questions based upon this situation. Round to the nearest tenth as needed.

- a) Use the relationship, Distance = Rate times Time or  $d = rT$ , to write a rational function  $T(r)$  that has the average rate of travel,  $r$  (in mph), as its input and the time of travel (in hours) as its output. The distance will be constant at 355 miles.
  
- b) If you average 55 mph, how long will the trip take?
  
- c) If the trip took 10 hours, what was your average rate of travel?
  
- d) Determine the vertical intercept of  $T(r)$  and interpret its meaning. If the vertical intercept does not exist, explain why (in the context of the story).
  
- e) Determine the horizontal intercept of  $T(r)$  and interpret its meaning. If the horizontal intercept does not exist, explain why (in the context of the story).
  
- f) Give the *equation* of the vertical asymptote of  $T(r)$ , and write a sentence explaining its significance in this situation.
  
- f) Give the *equation* of the horizontal asymptote of  $T(r)$ , and write a sentence explaining its significance in this situation.

**Problem 13** | **YOU TRY – Mixed Applications**

The table below shows the value,  $V$ , of an investment (in thousands of dollars) after  $n$  years.

$n$	0	3	5	10	15	22
$V(n)$	4.63	5.92	6.88	10.23	15.21	26.39

- Use your calculator to determine the exponential regression equation that models the set of data above. Round the “ $a$ ” value to two decimals, and round the “ $b$ ” value to three decimals. Use the indicated variables and proper function notation.
- Based on the equation found in part a, at what percent rate is the value of this investment increasing each year?
- Determine  $V(12)$ , and write your answer in a complete sentence. Round your answer to two decimal places.
- How long will it take for the value of this investment to reach \$100,000? Round your answer to two decimal places. Write your answer in a complete sentence.
- How long will it take for the value of the investment to double? Round your answer to two decimal places. Write your answer in a complete sentence.





**Problem 15** | **YOU TRY – Mixed Applications**

A resort hotel in Scottsdale, AZ charges \$1800 to rent a reception hall, plus \$58 per person for dinner and open bar. The reception hall can accommodate up to 200 people.

- a) Write a function,  $T$ , to represent the total cost to rent the reception hall if  $n$  people attend the reception.

$$T(n) = \underline{\hspace{4cm}}$$

- b) During the summer months, the hotel offers a discount of 15% off the total bill,  $T$ . Write a function,  $D$ , to represent the discounted cost if the total bill was  $T$ .

$$D(T) = \underline{\hspace{4cm}}$$

- c) Using the information above, write a formula for  $D(T(n))$  and complete the table below.

$$D(T(n)) = \underline{\hspace{4cm}}$$

$n$	0	50	100	150	200
$D(T(n))$					

- d) What information does the function  $D(T(n))$  provide in this situation? Be sure to identify the input and output quantities.

- e) Interpret the meaning of the statement  $D(T(100)) = 6460$ . Include all appropriate units.

- f) Determine the maximum number of people that can attend the reception for \$5,000 (after the discount is applied)?

