Lesson 2 Practice Problems

Section 2.1: Combining Functions

1. Let $f(x) = -3x + 2$ and $g(x) = x^2 + 4x - 7$.

    Find the following and simplify your result.

    a) $f(4) + g(4) =$

    b) $g(-3) - f(-3) =$

    c) $f(2) \cdot g(2) =$

    d) $\dfrac{g(0)}{f(0)} =$

2. Let $f(x) = 2x - 4$ and $g(x) = x^2 - 9$. Find the following.

a) $f(x) + g(x) =$

b) $g(x) - f(x) =$

c) $f(x) \cdot g(x) =$

d) $\dfrac{g(x)}{f(x)} =$

3. Add, subtract and multiply the following functions. Simplify your answers.

a) $f(x) = -4x + 7$ and $g(x) = -3x$

$f(x) + g(x) =$ $f(x) - g(x) =$

$f(x) \cdot g(x) =$ $g(x) - f(x) =$

b) $f(x) = -x + 2$ and $g(x) = -3x + 7$

$f(x) + g(x) =$ $f(x) - g(x) =$

$f(x) \cdot g(x) =$ $g(x) - f(x) =$

c) $f(x) = 3x^2 + 4x + 2$ and $g(x) = 6x + 1$

$f(x) \cdot g(x) =$ $f(4) + g(-1) =$

4. Simplify each of the following functions. Use only positive exponents in your final answer.

a) $f(x) = 32x^4 - 3x^7$ and $g(x) = 6x^4$

$\dfrac{f(x)}{g(x)} =$

b) $f(x) = 48x^9 - 16x^3 + 4$ and $g(x) = -8x^3$

$\dfrac{f(x)}{g(x)} =$

5. Use the tables of the functions below, find the following.

x	-2	-1	0	1	2
$f(x)$	-3	0	4	9	15

x	-2	-1	0	1	2
$g(x)$	12	8	1	-3	-5

   a) $f(2) + g(2) =$

   b) $g(-1) - f(-1) =$

   c) $f(0) \cdot g(0) =$

   d) $\dfrac{g(1)}{f(1)} =$

6. Functions $f(x)$ and $g(x)$ are defined in the tables below. Use those tables to evaluate problems the problems below.

x	-3	-2	0	1	4	5	8	10	12
$f(x)$	8	6	3	2	5	8	11	15	20

x	0	2	3	4	5	8	9	11	15
$g(x)$	1	3	5	10	4	2	0	-2	-5

   a) $f(5) =$ b) $g(5) =$
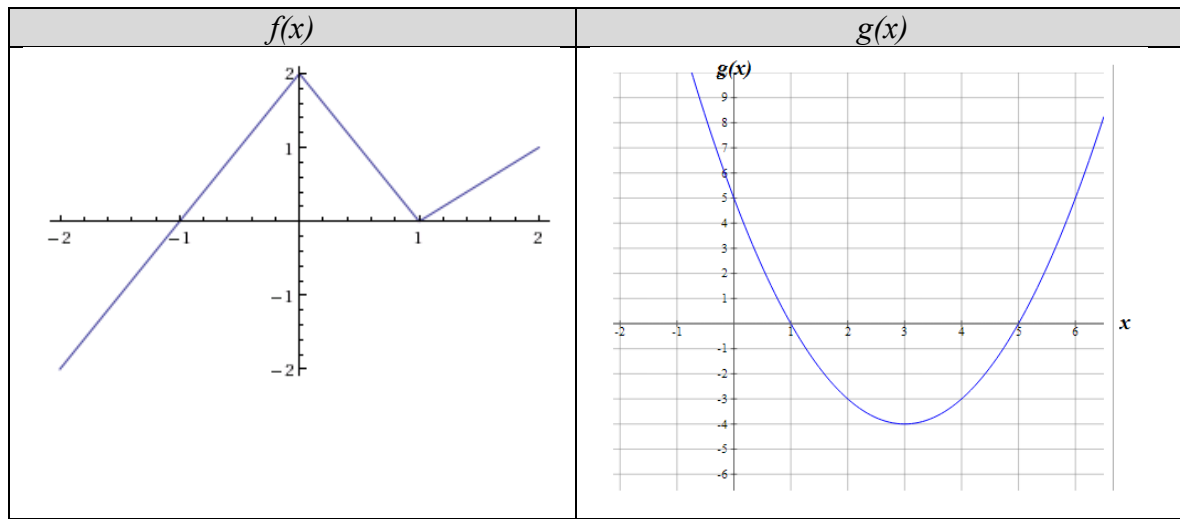
   c) $f(5) + g(5) =$ d) $f(0) - g(0) =$

   e) $f(8) \cdot g(8) =$ f) $f(4) \cdot g(0) =$

7. Use the graph to determine each of the following. Assume integer answers.

$f(x)$	$g(x)$

   a) $f(0) + g(0) =$ b) $f(1) - g(3) =$

   c) $f(-2) \cdot g(5) =$ d) $f(-1) \cdot g(2) =$

8. Functions f and g are defined below. Use those functions to evaluate the problems below.

   $f = \{(-3,4), (-2,6), (-1,8), (0,6), (1,-2)\}$ $g = \{(-1,8), (0,2), (4,3), (8,4)\}$

      a) $f(-2) + g(0) =$ b) $f(1) - g(4) =$

      c) $f(0) \cdot g(0) =$ d) $f(-1) \cdot g(8) =$

Section 2.2: Applications of Function Operations

9. The function $E(n)$ represents Ellen's budgeted monthly expenses for the first half of the year 2013. In the table, $n = 1$ represents January 2013, $n = 2$ February 2013, and so on.

n	1	2	3	4	5	6
$E(n)$	2263	2480	2890	2263	2352	2550

The function $L(n)$ shown in the table below represents Ellen's monthly income for the first half of the year 2013. In the table, $n = 1$ represents January 2013, $n = 2$ February 2013, and so on.

n	1	2	3	4	5	6
$L(n)$	2850	2850	2850	2850	2850	2850

a) At the end of each month, Ellen puts any extra money into a savings account. The function $S(n)$ represents the amount of money she puts into savings each month. Using the information above, complete the following table for the function $S(n)$.

n	1	2	3	4	5	6
$S(n)$						

b) Her goal is to save enough money to take a trip to Hawaii in July, 2013. She estimates that the trip will cost $2000. Will she be able to save up enough money to go to Hawaii in July? If so, how much extra money will he have to spend while she is there? If not, how much more does she need to earn?

10. Maria and Todd are organizing the 20 year reunion for their high school. The high school alumni association has given them $1000 for the event. They talk to the local caterer and find out the following:
    - It will cost $15 per person plus a $50 setup fee to provide food for the event.
    - It will cost $3 per person plus an $80 setup fee to rent the Meeting Hall at the local Holiday Motel.

    To help determine the costs, they come up with the following functions:
    - The cost for food is $50 + $15 per person. *F(x) = 15x + 50*
    - The cost for the Hall is $80 + $3 per person *H(x) = 3x + 80*

    In addition, they decide to charge each person $5 to get in the door. This can be modeled by the following function:
    - Income for the event is $1000 from the alumni + $5 per person. *I(x) = 5x + 1000*

    Given this information, answer the following questions. Show how you use the functions to calculate the answers. And give your final answers in complete sentences.

    If 400 people attend the event:

    a) How much will it cost for food?

    b) How much will it cost to rent the Meeting Hall?

    c) How much will it cost for food AND to rent the Meeting Hall? <u>Show how you use the functions to calculate this.</u> Hint: *F*(400) + *H*(400)

    d) The final bill for the event is found by subtracting the costs from the income. What would the final bill for the event be?

    e) <u>Challenge question</u>. How many people can attend if the costs have to equal the income?

11. Leonard has started a new business making cartoon bedspreads. His monthly expenses are
    $1322. Each bedspread costs $8.50 to produce.

    a) Complete the table below showing Leonard's business costs as a function of the number
       of bedspreads he makes.

n (number of bedspreads)	0	100	200	300	400
C(n) (Cost of n bedspreads)					

    b) Leonard is selling each bedspread for $17.50. Complete the table below showing
       Leonard's revenue as a function of the number of bedspreads he sells.

n (number of bedspreads)	0	100	200	300	400
R(n) (Revenue for n bedspreads)					

    c) The profit from Leonard's business can be found by subtracting the cost function from the
       revenue function. Complete the table below showing Leonard's profit as a function of
       the number of bedspreads he sells.

n (number of bedspreads)	0	100	200	300	400
P(n) (Profit for n bedspreads)					

    d) Using the information from parts a) through c), create algebraic functions for C, R and P.

       $C(n) =$

       $R(n) =$

       $P(n) =$

    e) Using the table from part c), make a rough estimate for the number of bedspreads Leonard
       needs to sell for his business to break even. (Breaking even means profit $= 0$)

    f) Using your formula for profit, P, determine the exact number of bedspreads Leonard
       needs to sell for his business to break even. (Breaking even means profit $= 0$)

Section 2.3: Composition of Functions

12. Let $f(x) = 4x - 2$ and $g(x) = -2x + 5$.   Evaluate each of the following.

a) $f(g(-2)) =$ b) $g(f(-2)) =$

c) $f(g(4)) =$ d) $g(f(0)) =$

13. Let $s(t) = t^2 - 2$ and $q(t) = -2t - 3$.   Evaluate each of the following.

a) $s(q(-2)) =$ b) $q(s(-2)) =$

c) $s(q(-1)) =$ d) $q(s(0)) =$

14. Let $f(x) = 4x - 2$ and $g(x) = -2x + 5$. Find each of the following.

a) $f(g(x)) =$

b) $g(f(x)) =$

15. Let $s(t) = t^2 - 7$ and $q(t) = t + 4$. Find each of the following.

a) $s(q(t)) =$

b) $q(s(t)) =$

16. Using the functions $f(x)$ and $g(x)$ defined by the tables below, evaluate the compositions.

x	1	2	3	4	5	6	7	8	9	10
$f(x)$	2	9	4	1	6	5	8	1	6	10

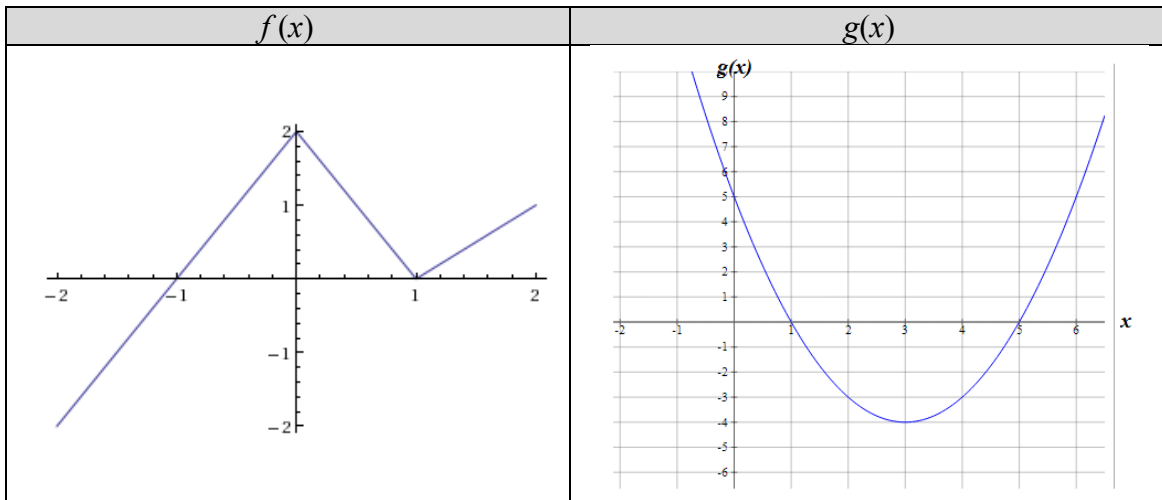| x	1	2	3	4	5	6	7	8	9	10
$g(x)$	4	11	10	8	6	5	8	2	6	9

a) $f(g(2)) =$

b) $f(g(7)) =$

c) $g(f(9)) =$

d) $f(f(8)) =$

e) $g(g(5)) =$

f) $g(f(10)) =$

17. Using the functions $f(x)$ and $g(x)$ defined by the graphs below, evaluate the compositions.

$f(x)$	$g(x)$

a) $f(g(1)) =$

b) $g(f(0)) =$

c) $g(f(-1)) =$

d) $f(g(5)) =$

Section 2.4: Applications of Function Composition

18. Raj likes playing video games. He earns 27 tokens every hour he plays.

a) Write a function, T, which represents the number of tokens Raj earns for the week if he plays h hours. Also complete the table below.

$T(h) =$ _____

h	10	20	30	40
$T(h)$				

b) Raj can use his tokens to buy additional plays on the game *Bollywood Dance*. Each *Bollywood Dance* games costs 80 tokens. Write a function, B, which represents the number of games of *Bollywood Dance* that Raj can buy in a week if he earns T tokens. Also complete the table below.

$B(T) =$ _____

T	270	540	810	1080
$B(T)$				

c) Using the information above, write a formula for $B(T(h))$ and complete the table below.

$B(T(h)) =$ _____

h	10	20	30	40
$B(T(h))$				

d) Determine the largest number of Bollywood Dance games Raj can buy if he plays 23 hours in a week.

e) Interpret the meaning of the statement $B(T(15)) = 5.0625$. Include all appropriate units.

19. A waterpark charges $1200 to rent the park per day, plus $37 for each person who attends. The waterpark can accommodate up to 200 people.

   a) Write a function, *T*, to represent the total cost to rent the waterpark if *n* people attend.

   $T(n) = $ _____

   b) During the winter months, the waterpark offers a discount of 12% off the total bill, *T*. Write a function, *D*, to represent the discounted cost if the total bill was $*T*.

   $D(T) = $ _____

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

   $D(T(n)) = $ _____

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 $D(T(75)) = 3498$. Include all appropriate units.

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