Principles of Calculus Modeling: An Interactive Approach by Donald Kreider, Dwight Lahr, and Susan Diesel
Exercises for Section 1.4

1. (1 pt)
Consider the function $f(x) = 2x - 7$. Is f one-to-one, and if so, why? Choose the best answer.

____

    A. f is one-to-one because any vertical line meets the graph at only one point.
    B. f is one-to-one because it is decreasing.
    C. f is not one-to-one.
    D. f is one-to-one because it is increasing.
    E. None of these.

Calculate the inverse function f^{-1}. Make sure your answer is in terms of x.
$f^{-1}(x) = $ _____

2. (1 pt)
Find the inverse function of $f(x) = -4 + x$.
$f^{-1}(x) = $ _____
What are the domain and range of f^{-1}?
If your answer is all real numbers, enter **R** in the first answer box and leave the others blank. If your answer is an interval, enter it in the form (**a** , **b**) in the first answer box and leave the others blank. If your answer is all real numbers except **a**, enter **R** in the first box, **except** in the second box, and **a** in the third box. If your answer is all real numbers **greater, greater than or equal to, less than, less than or equal to** some number **a**, enter **R** in the first box, $>, >=, <, <=$ (as appropriate) in the second box, and **a** in the third box. Do not enter quotes in your answers.

Domain:

_____ ____ _____

Range:

_____ ____ _____

3. (1 pt)
Find the inverse function of $f(x) = \dfrac{x}{-7 + x}$.

$f^{-1}(x) = $ _____
What are the domain and range of f and f^{-1}?
If your answer is all real numbers, enter **R** in the first answer box and leave the others blank. If your answer is an interval, enter it in the form (**a** , **b**) in the first answer box and leave the others blank. If your answer is all real numbers except **a**, enter **R** in the first box, **except** in the second box, and **a** in the third box. If your answer is all real numbers **greater, greater than or equal to, less than, less than or equal to** some number **a**, enter **R** in the first box, $>, >=, <, <=$ (as appropriate) in the second box, and **a** in the third box. Do not enter quotes in your answers.

Domain of f:

_____ ____ _____

Range of f:

_____ ____ _____

Domain of f^{-1}:

_____ ____ _____

Range of f^{-1}:

_____ ____ _____

4. (1 pt)
Find $f^{-1}(10)$ if $f(x) = x^3 + x$.
$f^{-1}(10) = $ _____

5. (1 pt)
Below is the graph of a function f. (**Click image for a larger view**)
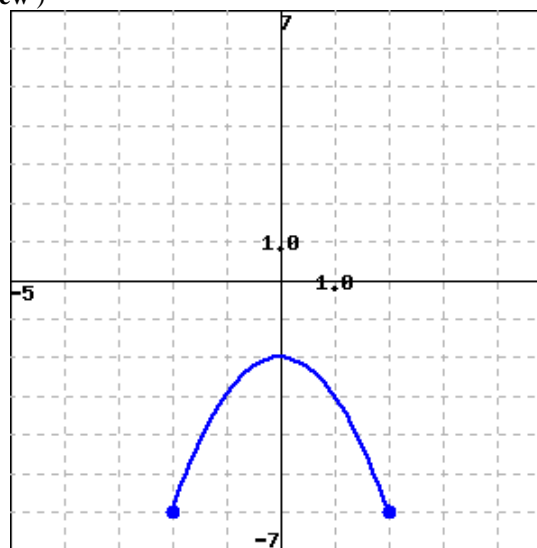
Match each of the graphs below with the corresponding transformation of the function.
____1. $f(x) - 1$
____2. $-f(x)$
____3. $f(x - 1)$
____4. $-\frac{1}{2}f(x - 1)$

| A | B | C | D |
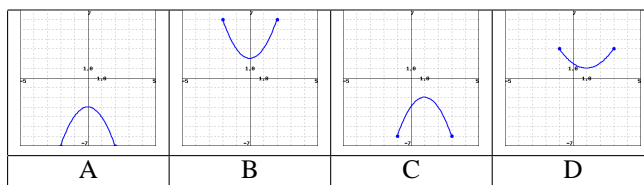
6. (1 pt)
Given the functions $f(x) = \dfrac{x - 1}{x + 10}$ and $g(x) = 1 - \dfrac{10}{x}$, construct the following composite functions and determine if there are any values of x which are not in the domain of the composite.

If the composite function is defined for all values of x, then leave the answer boxes for values not in the domain blank. If

0 is one of your answers, enter 0 first, then any nonzero answers. Enter remaining answers in increasing numerical order (i.e. negative numbers before positive numbers). Leave any unused boxes blank.

$f \circ g(x) = $ _____

Values **not** in the domain of $f \circ g(x)$:

_____

_____

$g \circ f(x) = $ _____

Values **not** in the domain of $g \circ f(x)$:

_____

_____

7. (1 pt)
If $g(x) = x - 8$ and $f \circ g(x) = x$, then what is $f(x)$?

$f(x) = $ _____

8. (1 pt)
Start with the function $y = \sqrt{x}$. At each stage, describe the effect of the indicated changeon the graph of the previous function. You may use the applet, Maple, or another computer program to examine the graphs of the functions. Choose your answers from the list below.

___ $y = 3 + \sqrt{x}$

___ $y = 3 + \sqrt{-5 + x}$

___ $y = \dfrac{1}{3 + \sqrt{-5 + x}}$

Answers:
a. Shifts previous graph upwards (vertically) by 3
b. Shifts previous graph upwards (vertically) by 5
c. Shifts previous graph downwards (vertically) by 3
d. Shifts previous graph downwards (vertically) by 5
e. Shifts previous graph to the left (horizontally) by 3
f. Shifts previous graph to the left (horizontally) by 5
g. Shifts previous graph to the right (horizontally) by 3
h. Shifts previous graph to the right (horizontally) by 5
i. Reflects previous graph across the x-axis
j. Reflects previous graph across the y-axis
k. Reflects previous graph across the origin
l. None of the above

9. (1 pt)
Below is the graph of a function f. (**Click the image for a larger view**)

Consider the domain of f to be $[-3, 1]$ and the range to be $[-2, 2]$. For each of the following variations on f specify the domain and range.

$2f((x+1)/2)$
Domain:
[_____ , _____]
Range:
[_____ , _____]

$-1 + f(x/2)$
Domain:
[_____ , _____]
Range:
[_____ , _____]

$\frac{-1}{2} f(x)$
Domain:
[_____ , _____]
Range:
[_____ , _____]

10. (1 pt)
Find the inverse function of $f(x) = \dfrac{x-4}{x+4}$.

$f^{-1}(x) = $ _____

11. (1 pt)
Given the functions $f(x) = \sqrt{7x+7}$ and $g(x) = 5x^2 + 8x + 3$, construct the following composite function and determine its domain.

$g \circ f = $ _____

Domain of $g \circ f$: all values of x such that $x \geq$ _____

12. (1 pt)
Given the functions $f(x) = \sqrt{7x - 192}$ and $g(x) = \sqrt{8x+3}$, find their domains, and construct the following composite function and determine its domain.

2

Domain of f: all values of x such that $x \geq$

_____

Domain of g: all values of x such that $x \geq$ _____

$f \circ g =$ _____

Domain of $f \circ g$: all values of x such that $x \geq$

_____

13. (1 pt)

Consider the following table of values.

x	y
1	324
2	441
3	576
4	729

If the values in the table correspond to a function $y = f(x)$, which of the following functions could be $f^{-1}(x)$?

___

A. $\sqrt{\frac{x-5}{9}}$

B. $9(x^2 + 10x + 25)$

C. $\sqrt{\frac{x}{9}} - 5$

D. $\frac{1}{9}(x+5)^2$

14. (1 pt)

Consider the following table of values (rounded to four decimal places).

x	y
1	10.2470
2	11.2250
3	12.2066
4	13.1909

If the values in the table correspond to a function $y = f(x)$, which of the following functions could be $f^{-1}(x)$?

___

A. $\sqrt{(x-9)^2 + 5}$

B. $-9 + \sqrt{x^2 - 5}$

C. $\sqrt{(x+9)^2 - 5}$

D. $-5 + \sqrt{x^2 - 9}$

15. (1 pt)

Consider the function $f(x) = x^2 + 24x + 98$ with domain $x \geq 12$. Determine the inverse function $f^{-1}(x)$ and its domain.

$f^{-1}(x) =$ _____

Domain of f^{-1}: all values of x such that $x \geq$

_____

16. (1 pt)

Consider the function $f(x) = \sqrt{x^2 + 2x + 44}$. Determine the inverse function $f^{-1}(x)$ and its domain.

$f^{-1}(x) =$ _____

Domain of f^{-1}: all values of x such that $x \geq$

_____