32 Composite Functions

Due:
12/15/2015 at 06:00am EST.

Students will be able to:

- Evaluate the sum, difference, product and quotient of functions
- Evaluate composition of functions given by their formulas
- Evaluate composition of functions given by their graphs
- Determine the domain of composition and arithmetic combination of two functions
- Decompose a function into a composition of two simpler functions

Functions and symbols that WeBWorK understands.

Links to some useful WeBWorK pages for students

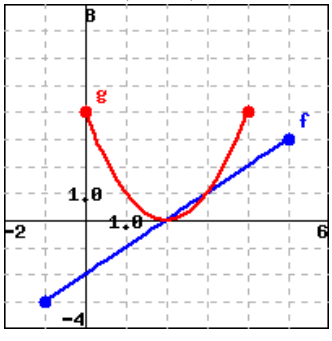
1. (1 pt) This problem gives you some practice identifying how more complicated functions can be built from simpler functions.

Let $f(x) = x^3 - 27$and let $g(x) = x - 3$. Match the functions defined below with the letters labeling their equivalent expressions.

___1. $f(g(x))$
___2. $g(f(x))$
___3. $(f(x))^2$
___4. $f(x)/g(x)$

A. $-54+27x-9x^2+x^3$
B. $-30+x^3$
C. $9+3x+x^2$
D. $729-54x^3+x^6$

2. (1 pt) Let f be the linear function (in blue) and let g be the parabolic function (in red) below.



Evaluate the following:

1. $(f \circ g)(2)$ = _____
2. $(g \circ f)(2)$ = _____
3. $(f \circ f)(2)$ = _____
4. $(g \circ g)(2)$ = _____
5. $(f+g)(4)$ = _____
6. $(f/g)(2)$ = _____

Enter "DNE" if an answer does not exist.

3. (1 pt) If the function $h(x) = (x-5)^5$ is expressed in the form $f \circ g$ with $f(x) = x^5$, then find the function $g(x)$.
$g(x)$= _____

4. (1 pt) If the function $h(x) = \dfrac{1}{x+8}$ is expressed in the form $f \circ g$ with $g(x) = x+8$, then find the function $f(x)$.
$f(x)$= _____

5. (1 pt) Let f, g and h be defined as below. Evaluate $(f \circ g \circ h)(x)$.

$$\begin{aligned} f(x) &= x^4+6 \\ g(x) &= x-3 \\ h(x) &= \sqrt{x} \end{aligned}$$

$(f \circ g \circ h)(x)$ = _____

6. (1 pt) **If the answer is ∞, input infinity; if the answer is $-\infty$, input -infinity.**
Given that $f(x) = \frac{1}{x}$ and $g(x) = 9x-7$, calculate
(a) $f \circ g(x)$= _____, its domain is all real numbers except _____
(b) $g \circ f(x)$= _____ , its domain is all real numbers except _____
(c) $f \circ f(x)$= _____, its domain is all real numbers except _____
(d) $g \circ g(x)$= _____, its domain is (_____, _____)

7. (1 pt) **For this question, input infinity for ∞ and input -infinity for $-\infty$.**
Given that $f(x) = x^2 - 3x$ and $g(x) = x+10$, find
(a) $f+g$= _____ and its domain is (_____, _____)
(b) $f-g$= _____ and its domain is (_____, _____)
(c) fg= _____ and its domain is (_____, _____)
(d) f/g= _____ and its domain is $x \neq$_____

8. (1 pt) Let $f(x) = \dfrac{1}{5x}$, $g(x) = 3x^3$, and $h(x) = 8x^2+8$.
Then $f \circ g \circ h(1)$ =_____

9. (1 pt) Let $f(x) = \dfrac{1}{x}$ and $g(x) = 9x - 9$. Evaluate the following:

1. $(f \circ g)(x)$ = _____
2. $(g \circ f)(x)$ = _____
3. $(f \circ f)(x)$ = _____
4. $(g \circ g)(x)$ = _____

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10. (1 pt) Given that $f(x) = |x|$ and $g(x) = 9x + 3$, calculate
(a) $f \circ g(x)$= _____, its domain is (_____, _____)
(b) $g \circ f(x)$= _____ , its domain is (_____, _____)
(c) $f \circ f(x)$= _____, its domain is (_____, _____)
(d) $g \circ g(x)$= _____, its domain is (_____, _____)
Note: If needed enter ∞ as *infinity* and $-\infty$ as *-infinity* .

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11. (1 pt) Given that $f(x) = x^2 - 8x$ and $g(x) = x + 10$, find
(a) $f + g$= _____
(b) $f - g$= _____
(c) fg= _____
(d) f/g= _____

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12. (1 pt) Let $f(x) = 3x + 4$ and $g(x) = 3x^2 + 3x$.
$(f + g)(7)$ = _____

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13. (1 pt) Use substitution to compose $D = 9p - 2$ and $p = 5q^4$. Enter your answer as an equation, and simplify your answer as much as possible.

_____

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14. (1 pt) Use substitution to compose $y = 2u^2$ and $u = 3x - 4$. Enter your answer as an equation, and simplify your answer as much as possible.

_____

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15. (1 pt) Express the function $y = \sqrt{x^2 + 8}$ as a composition $y = f(g(x))$ of two simpler functions $y = f(u)$ and $u = g(x)$.

$f(u)$ = _____

$g(x)$ = _____

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16. (1 pt) Express the function $y = 2(x - 6)^5$ as a composition $y = f(g(x))$ of two simpler functions $y = f(u)$ and $u = g(x)$.

$f(u)$ = _____

$g(x)$ = _____

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17. (1 pt) Use substitution to compose $y = 4u^2 + 3u + 5$ and $u = 3x^4$. Enter your answer as an equation, and simplify your answer as much as possible.

_____

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18. (1 pt) Suppose $f(x) = x^3 + 2$ and $g(x) = \sqrt{x}$. Then

$f(g(x))$ = _____

$g(f(x))$ = _____

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19. (1 pt) If $f(g(x)) = 5(x^7 + 2)^3$ and $g(x) = x^7 + 2$, find $f(x)$.

$f(x)$ = _____

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20. (1 pt) Let $f(x) = x^2 + 9x$ and $g(x) = x - 3$. Evaluate the following:

1. $(f \circ g)(x)$ = _____
2. $(g \circ f)(x)$ = _____
3. $(f \circ f)(x)$ = _____
4. $(g \circ g)(x)$ = _____

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21. (1 pt) Given that $f(x) = 5x - 6$ and $g(x) = 3 - x^2$, calculate
(a) $f \circ g(x)$= _____
(b) $g \circ f(x)$= _____

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22. (1 pt) Use abs(x) for $|x|$.

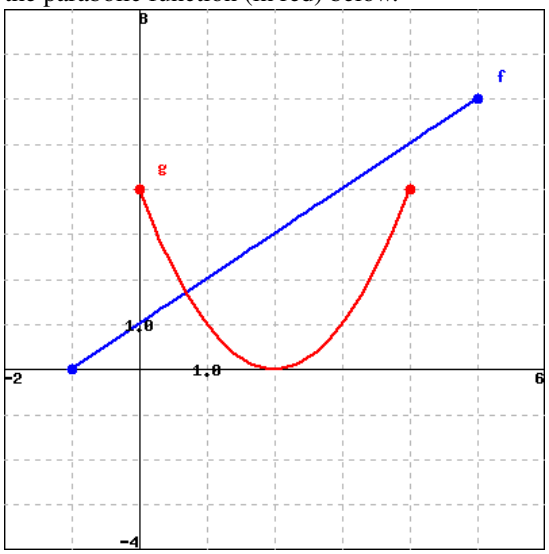
Given that $f(x) = |x|$ and $g(x) = 9x - 6$, calculate
(a) $f \circ g(x)$= _____

(b) $g \circ f(x)$= _____

(c) $f \circ f(x)$= _____

(d) $g \circ g(x)$= _____

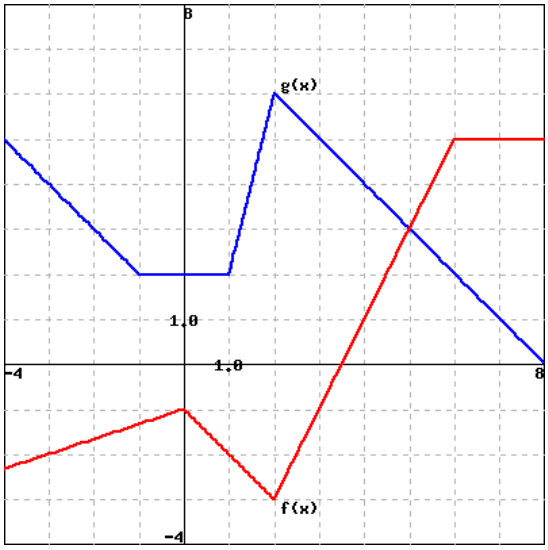
23. (1 pt) Let f be the linear function (in blue) and let g be the parabolic function (in red) below.



Note: If the answer does not exist, enter 'DNE':

1. $(f \circ g)(2) =$ ___
2. $(g \circ f)(2) =$ ___
3. $(f \circ f)(2) =$ ___
4. $(g \circ g)(2) =$ ___
5. $(f+g)(4) =$ ___
6. $(f/g)(2) =$ ___

24. (1 pt) The functions $f(x)$ and $g(x)$ are given in the graph below ($f(x)$ in red and $g(x)$ in blue).



Note: Click on the graph to view a larger graph

Find the corresponding function values.

$(f+g)(5)$ = _____

$(f-g)(5)$ = _____