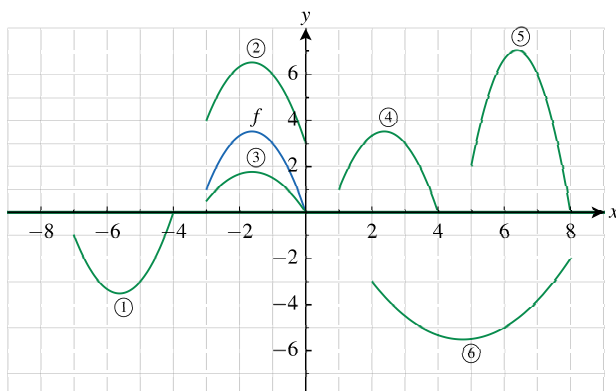


## Thursday Night PreCalculus, October 26, 2023

### New Functions from Old: Inverses, Transformations, and Compositions

#### Problems

1. The graph of  $f$  is given in the figure. Match each equation with its graph and give a reason for each choice.



- (a)  $y = f(x - 4)$                       (b)  $y = f(x) + 3$                       (c)  $y = 2f(x - 8)$   
(d)  $y = \frac{1}{2}f(x)$                       (e)  $y = -f(x + 4)$                       (f)  $y = -f(\frac{1}{2}(x - 8)) - 2$

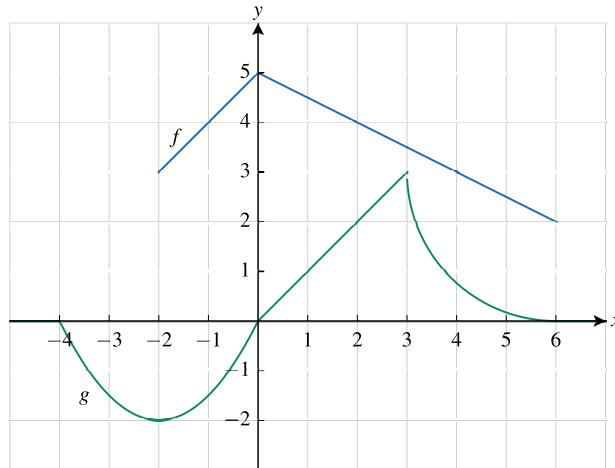
2. Find (a)  $f + g$ , (b)  $f - g$ , (c)  $fg$ , and (d)  $f/g$ , and state their domains.

- (i)  $f(x) = 2^x$ ,       $g(x) = 3^x$   
(ii)  $f(x) = \log x$ ,       $g(x) = \ln x$   
(iii)  $f(x) = x^3 + 2x^2$ ,       $g(x) = -2x^2 - 1$   
(iv)  $f(x) = \sqrt{4 - x}$ ,       $g(x) = |x + 3|$

3. Find the functions (a)  $f \circ g$ , (b)  $g \circ f$ , (c)  $f \circ f$ , and (d)  $g \circ g$ , and state their domains.

- (i)  $f(x) = 2^x$ ,       $g(x) = 3x$   
(ii)  $f(x) = 2^x$ ,       $g(x) = \log x$   
(iii)  $f(x) = \sqrt{x + 1}$ ,       $g(x) = -2x + 3$   
(iv)  $f(x) = \frac{x}{x + 1}$ ,       $g(x) = \cos 2x$

4. Use the graphs of  $f$  and  $g$  to evaluate each expression, or explain why it is undefined.



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

(b)  $g(f(4))$

(c)  $(f \circ g)(-2)$

(d)  $(g \circ f)(6)$

(e)  $(g \circ g)(-2)$

(f)  $(f \circ f)(0)$

(g)  $(g \circ f)(5)$

(h)  $(f \circ g \circ f)(4)$

(i)  $(g \circ f \circ g)(-2)$

5. Find a formula for the inverse of the function.

(a)  $f(x) = 1 + \sqrt{3 + 7x}$

(b)  $f(x) = \frac{4x - 1}{2x + 3}$

(c)  $f(x) = \sqrt{1 - x^2}, \quad 0 \leq x \leq 1$

(d)  $f(x) = 3 + \log_2 x, \quad x > 0$