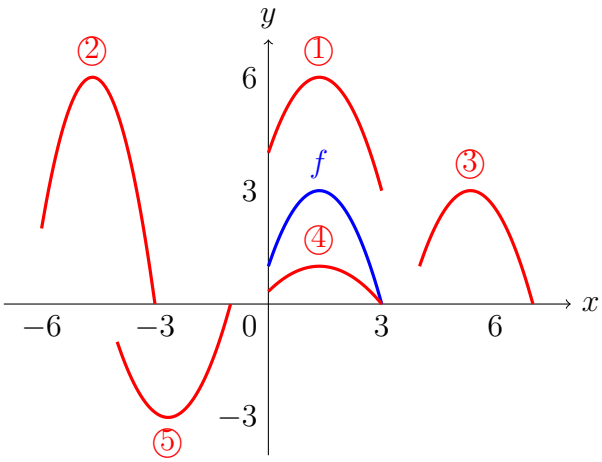
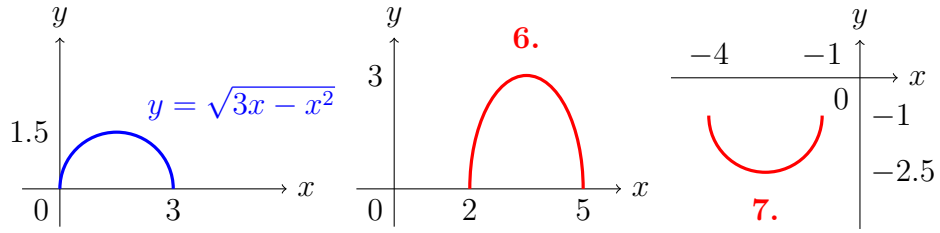
Homework 1.3

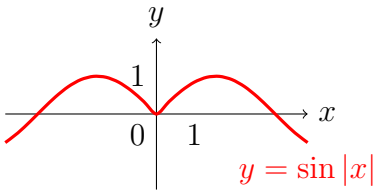
3. (a) $y = f(x-4) =$ ③.
(b) $y = f(x)+3 =$ ①.
(c) $y = \frac{1}{3}f(x) =$ ④.
(d) $y = -f(x+4) =$ ⑤.
(e) $y = 2f(x+6) =$ ②.



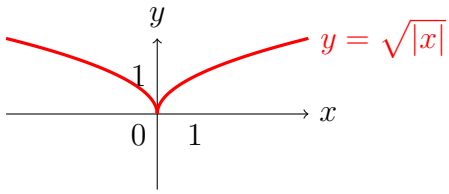
6+7. 6. $y = 2\sqrt{3(x-2)-(x-2)^2} = 2\sqrt{7x-x^2-10}$.
7. $y = -\sqrt{3(x+4)-(x+4)^2}-1 = -\sqrt{-5x-x^2-4}-1$.



29. (a) $f|x|$ is an even function whose graph is the same as f for $x \geq 0$.
(b)



(c)



34. $f(x) = x^3 - 2$, $g(x) = 1 - 4x$.
(a) $f \circ g = (1-4x)^3 - 2 = -1 - 12x + 48x^2 - 64x^3$, $x \in \mathbb{R}$.
(b) $g \circ f = 1 - 4(x^3-2) = 9 - 4x^3$, $x \in \mathbb{R}$.
(c) $f \circ f = (x^3-2)^3 - 2 = x^9 - 6x^6 + 12x^3 - 10$, $x \in \mathbb{R}$.
(d) $g \circ g = 1 - 4(1-4x) = 16x - 3$, $x \in \mathbb{R}$.

37. $f(x) = x + \dfrac{1}{x}$, $g(x) = \dfrac{x+1}{x+2}$.

(a) $f \circ g = \left(\dfrac{x+1}{x+2}\right) + \dfrac{1}{\frac{x+1}{x+2}} = \dfrac{x+1}{x+2} + \dfrac{x+2}{x+1}$, $x \notin \{-1, -2\}$.

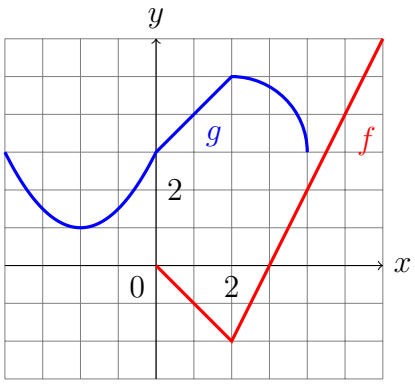
(b) $g \circ f = \dfrac{\left(x + \frac{1}{x}\right) + 1}{\left(x + \frac{1}{x}\right) + 2} = \dfrac{x(x^2+x+1)}{x(x+1)^2}$, $x \notin \{0, 1\}$.

(c) $f \circ f = \left(x + \dfrac{1}{x}\right) + \dfrac{1}{x + \frac{1}{x}} = \dfrac{x^2+1}{x} + \dfrac{x}{x^2+1}$, $x \notin \{0\}$.

(d) $g \circ g = \dfrac{\frac{x+1}{x+2} + 1}{\frac{x+1}{x+2} + 2} = \dfrac{(x+2)(2x+3)}{(x+2)(3x+5)}$, $x \notin \{-2, -\dfrac{5}{3}\}$.

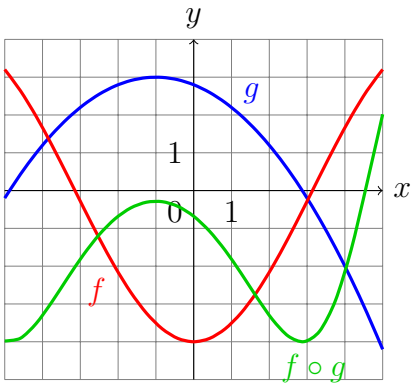
50. $f(x) = \sqrt[8]{x}$, $g(x) = 2 + x$, $h(x) = |x|$. (Hint: $H(x) = \sqrt[8]{2 + |x|}$.)

53. (a) $f(g(2))[= f(5)] = 4$.
(b) $g(f(0))[= g(0)] = 3$.
(c) $(f \circ g)(0)[= f(3)] = 0$.
(d) $(g \circ f)(6) = g(6)$ undefined.
(e) $(g \circ g)(-2)[= g(1)] = 4$.
(f) $(f \circ f)(4)[= f(2)] = -2$.



54.

x	$f(g(x))$	x	$f(g(x))$
-5	-3.98	1	-1.81
-4	-3.30	2	-3.30
-3	-1.81	3	-3.98
-2	-0.68	4	-2.16
-1	-0.28	5	2.02
0	-0.68		

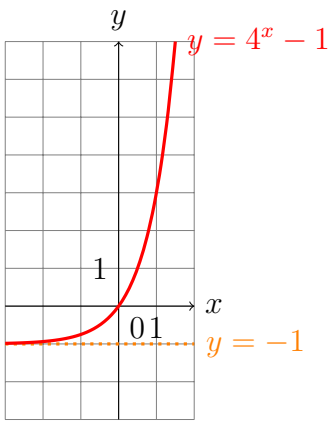


66. No. [Hint: $f(x) = x + 1$ and $g(x) = x$.]
Odd. [Hint: $f(g(-x)) = f(-g(x)) = -f(g(x))$.]
Even. [Hint: $f(g(-x)) = f(-g(x)) = f(g(x))$.]

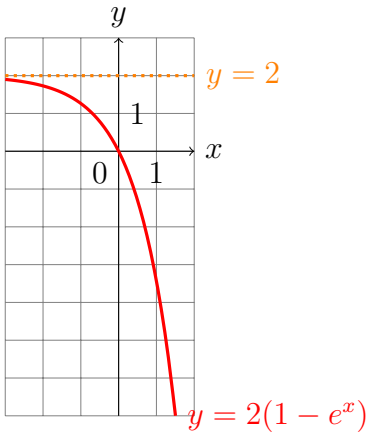
Homework 1.4

3. (a) $16b^{12}$. (b) $648y^7$.

11.



16.



19. (a) $f(x) = \dfrac{1-e^{x^2}}{1-e^{1-x^2}}$,
domain $x \notin \{-1, 1\}$, $\{x \in \mathbb{R} : x \neq \pm 1\}$, or $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$.
(b) $f(x) = \dfrac{1+x}{e^{\cos x}}$, domain for all x, $\mathbb{R}$, or $(-\infty, \infty)$.

Homework 1.5

16. $f^{-1}(3) = 1,\ f(f^{-1}(2)) = 2.$

22. $f^{-1}(x) = \dfrac{3x+1}{4-2x}.$

26. $f^{-1}(x) = \ln\dfrac{1+x}{1-x}.$

53. (a) $x = 5 + \lg 3 = 5 + \dfrac{\ln 3}{\ln 2}.$

(b) $x = \dfrac{1+\sqrt{1+4e}}{2}.$ [Hint: $x > 1,\ \dfrac{1-\sqrt{1+4e}}{2} < 0$ 不合.]

57. (a) $(\ln 3, \infty)$. (b) $f^{-1}(x) = \ln(e^x + 3),\ \mathbb{R} = (-\infty, \infty).$

68. (a) $\arcsin(\sin(5\pi/4))[= \sin^{-1}\dfrac{-1}{\sqrt{2}}] = -\dfrac{\pi}{4}.$

(b) $\cos(2\sin^{-1}(\frac{5}{13}))[= 1 - 2\sin^2\sin^{-1}\dfrac{5}{13} = 1 - 2\Big(\dfrac{5}{13}\Big)^2] = \dfrac{119}{169}.$

70. $\tan(\sin^{-1} x) = \dfrac{x}{\sqrt{1-x^2}}.$