MATH 180 Worksheet
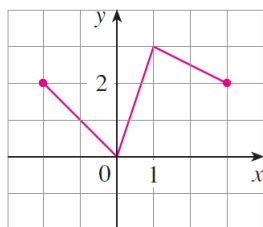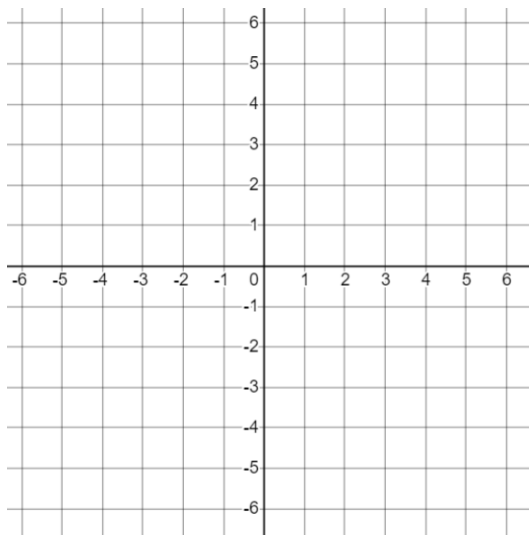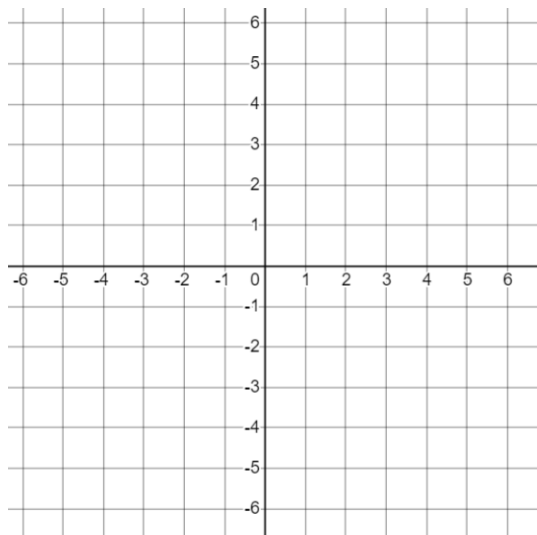
Section 1.3: New Functions from Old Functions

Exercise 1 Explain how each graph is obtained from the graph of $y = f(x)$.

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

Exercise 2 The graph of f is given. Draw the graphs of the following functions.

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

Exercise 3 Graph the function by hand, not by plotting points, but by starting with the graph of one of the standard functions given in Section 1.2, and then applying the appropriate transformations.

(a) $y = -(x - 3)^2$
(b) $y = 1 - \frac{1}{x+2}$
(c) $y = 2\sqrt{x + 1}$
(d) $y = 3 - 2\sin(x)$
(e) $y = 2|x| - 3$
(f) $y = \frac{1}{4}\tan(x - \frac{\pi}{4})$
(g) $y = |\cos(\pi x)|$

Exercise 4   Let $f(x) = \sqrt{3-x}$ and $g(x) = \sqrt{x^2 - 1}$. Find the following functions and state their domains.

(a) $f + g$

(e) $f \circ g$

(b) $f - g$

(f) $g \circ f$

(c) $f \cdot g$

(g) $f \circ f$

(d) $\frac{f}{g}$

(h) $g \circ g$

Exercise 5   Express $G(x) = \sqrt[3]{\frac{x}{1+x}}$ in the form $f \circ g$ by finding $f(x)$ and $g(x)$.

Exercise 6   Express $u(t) = \frac{\tan(t)}{1+\tan(t)}$ in the form $f \circ g$ by finding $f(t)$ and $g(t)$.

Exercise 7   Use the given graphs of f and g to estimate the value of $f(g(x))$ for $x = -5, -4, -3, \ldots, 5$. Use these estimates to sketch a rough graph of $f \circ g$.