1.3.2 (a) $y = 5f(x)$ stretches graph vertically by a factor of 5.

(b) $y = f(x-5)$ shifts graph horizontally by 5 units to RIGHT.

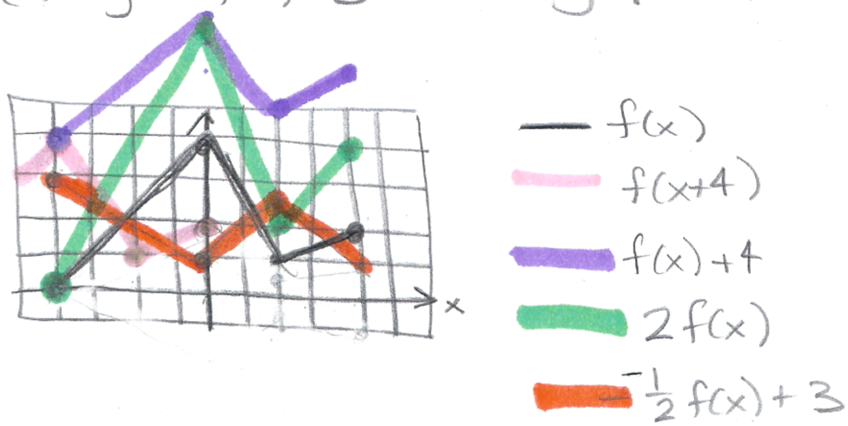
(c) $y = -f(x)$ reflects graph across x-axis

(d) $y = -5f(x)$ reflect graph in part (a) across x-axis.

(e) $y = f(5x)$ compresses graph horizontally by a factor of 5.

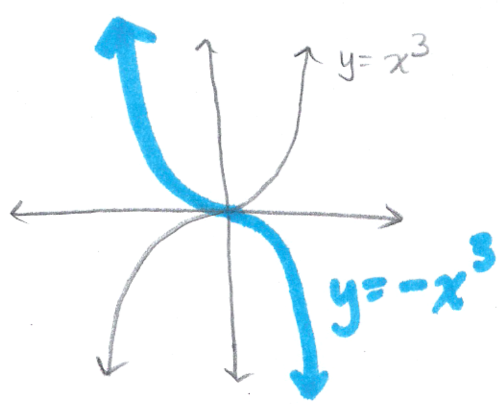
(f) $y = 5f(x) - 3$ moves graph in part (a) 3 units down.

1.3.4

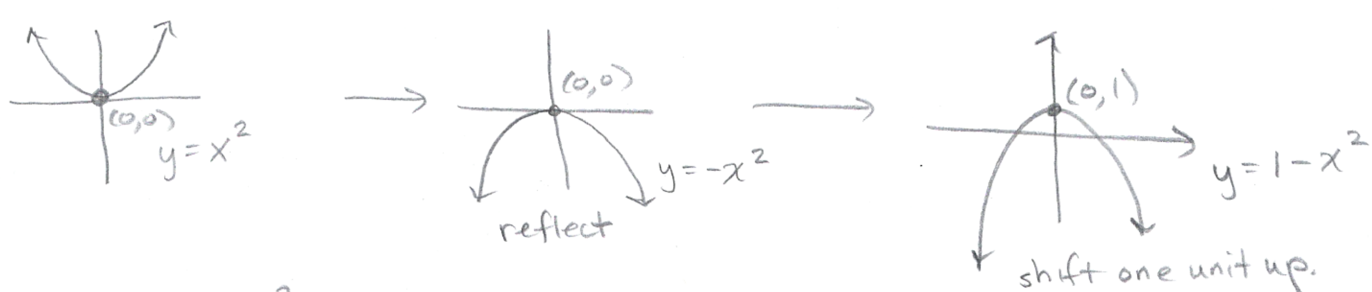


$f(0) = 4$
$f(2) = 1$
$f(4) = 2$
$f(-4) = 0$

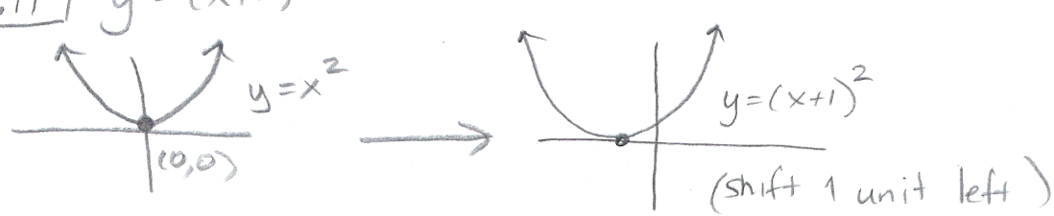
1.3.9 $y = -x^3$



1.3.10 $y = 1 - x^2$



1.3.11 $y = (x+1)^2$

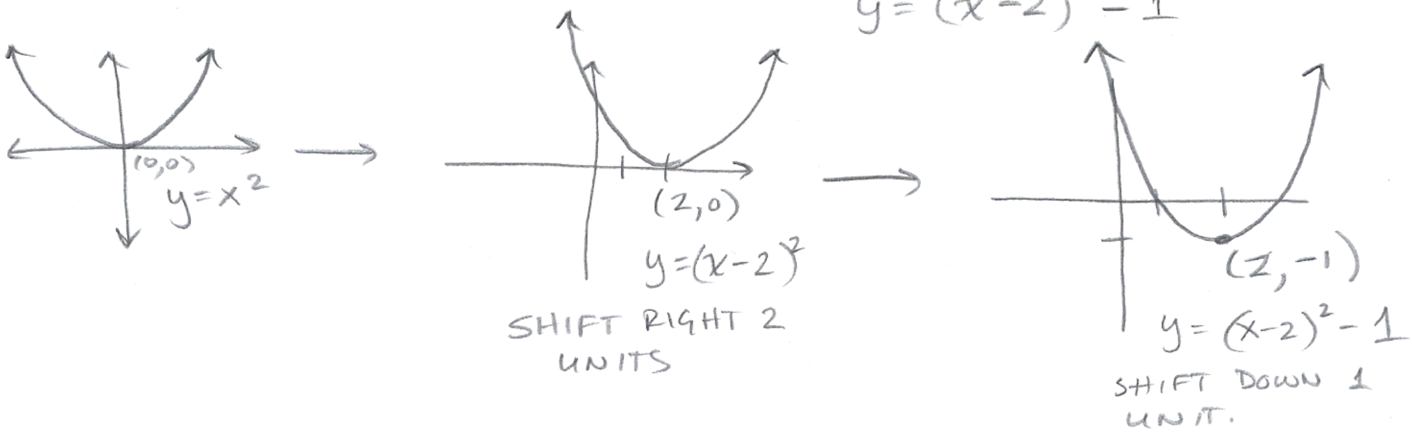


$\boxed{1.3.12}$ $y = x^2 - 4x + 3$

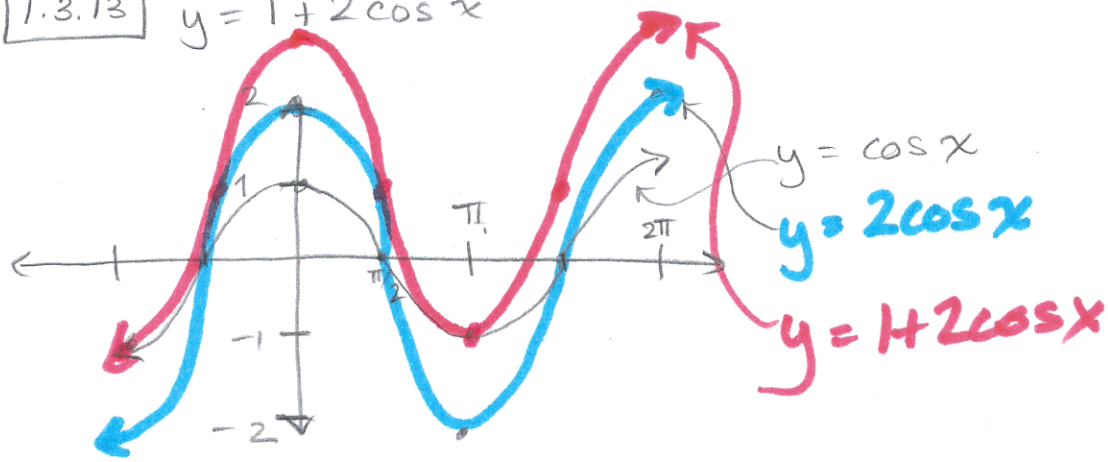
Rewrite by completing the square

$y = (x^2 - 4x + 4) + 3 - 4$

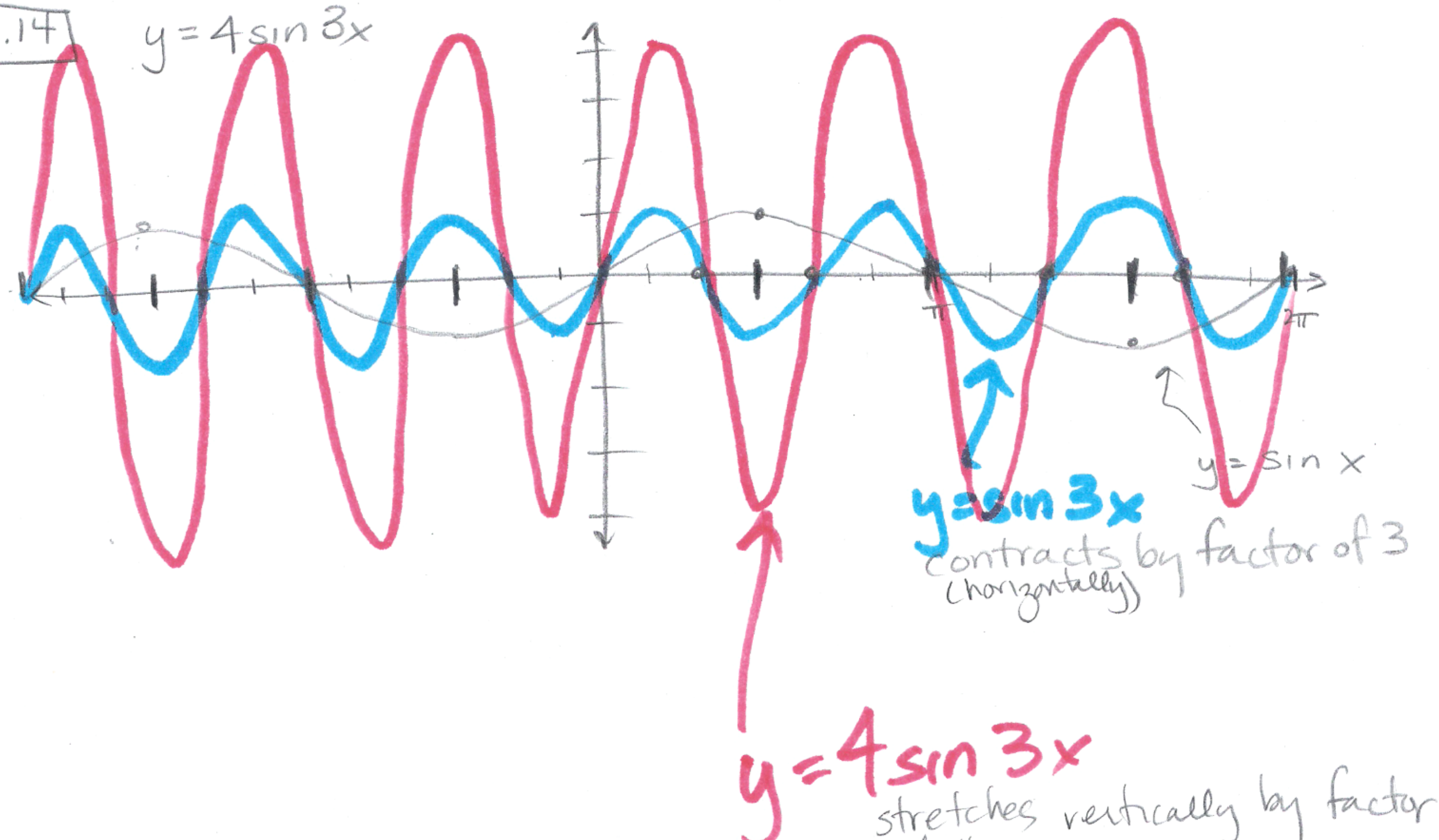
$y = (x-2)^2 - 1$



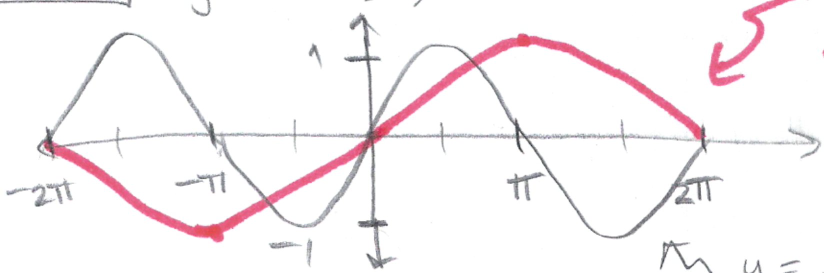
$\boxed{1.3.13}$ $y = 1 + 2\cos x$



$\boxed{1.3.14}$ $y = 4\sin 3x$



$\boxed{1.3.15}$ $y = \sin\left(\frac{x}{2}\right)$



$y=\sin\left(\frac{x}{2}\right)$ stretches horizontally by a factor of 2.

$y = \sin(x)$

$\boxed{1.3.32}$ Let $f(x) = x-2$, $g(x) = x^2+3x+4$.
The domains of f and g are all real numbers. The domains of the requested compositions will also be all real numbers.

(a) $f\circ g(x) = f(g(x)) = f(x^2+3x+4) = x^2+3x+4-2$
$= x^2+3x+2$

(b) $g\circ f(x) = g(f(x)) = g(x-2) = (x-2)^2+3(x-2)+4$
$= (x^2-4x+4)+(3x-6)+4$
$= x^2-x+2.$

(c) $f\circ f(x) = f(f(x)) = f(x-2) = (x-2)-2 = x-4$

(d) $g\circ g(x) = g(g(x)) = g(x^2+3x+4) = (x^2+3x+4)^2 + 3(x^2+3x+4)+4$
(You can finish the algebra if you so desire.)

$\boxed{1.3.43}$ $F(x) = \dfrac{\sqrt[3]{x}}{1+\sqrt[3]{x}}$

Let $f(x) = \dfrac{x}{1+x}$

and $g(x) = \sqrt[3]{x}$.

Then $f\circ g(x) = f(\sqrt[3]{x}) = \dfrac{\sqrt[3]{x}}{1+\sqrt[3]{x}} = F(x).$

$\boxed{1.3.44}$ $G(x) = \sqrt[3]{\dfrac{x}{1+x}}$

Let $f(x) = \sqrt[3]{x}$ and $g(x) = \dfrac{x}{1+x}$.

Then $f\circ g(x) = f\left(\dfrac{x}{1+x}\right) = \sqrt[3]{\dfrac{x}{1+x}} = G(x)$

$\boxed{1.3.50}$ Using the table to evaluate

(a) $f(g(1)) = f(6) = 5$

(b) $g(f(1)) = g(3) = 2$

(c) $f(f(1)) = f(3) = 4$

(d) $g(g(1)) = g(6) = 3$

(e) $g \circ f(3) = g(f(3)) = g(4) = 1$

(f) $f \circ g(6) = f(g(6)) = f(3) = 4$.

$\boxed{1.3.63}$ If f and g are even functions, then $f(-x) = f(x)$ and

(a) $g(-x) = g(x)$ for all $x \in \mathbb{R}$.

Now $f+g\,(-x) = f(-x) + g(-x) = f(x) + g(x) = f+g\,(x)$

and $f \cdot g\,(-x) = f(-x) \cdot g(-x) = f(x)\,g(x) = f \cdot g\,(x)$.

So $f+g$ and fg are also even.

(b) If f and g are odd functions, then $f(-x) = -f(x)$ and $g(-x) = -g(x)$.

Now $f+g(-x) = f(-x) + g(-x) = -f(x) + -g(x) = -(f+g)(x)$.

So $f+g$ is also odd.

But $f \cdot g(-x) = f(-x) \cdot g(-x) = -f(x) \cdot (-g(x)) = fg(x)$

So fg is even in this case!

$\boxed{1.3.64}$ Suppose f is even and g is odd. Then

$f(-x) = f(x)$ and $g(-x) = -g(x)$.

Consider the function fg.

$fg(-x) = f(-x) \cdot g(-x) = f(x) \cdot (-g(x)) = -f(x)g(x) = -fg(x)$

So the product in this case is <u>odd</u>.