For each kind of the following problems, graph both $f(x)$ and $g(x)$, then determine a linear map which transforms one into the other.

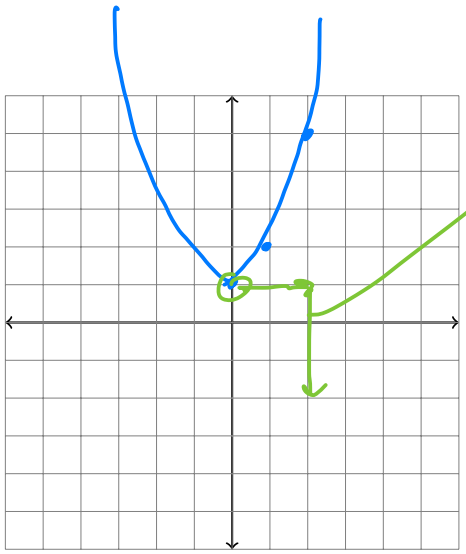
(a) $f(x) = x^2 + 1$, $g(x) = x^2 - 4x + 2$

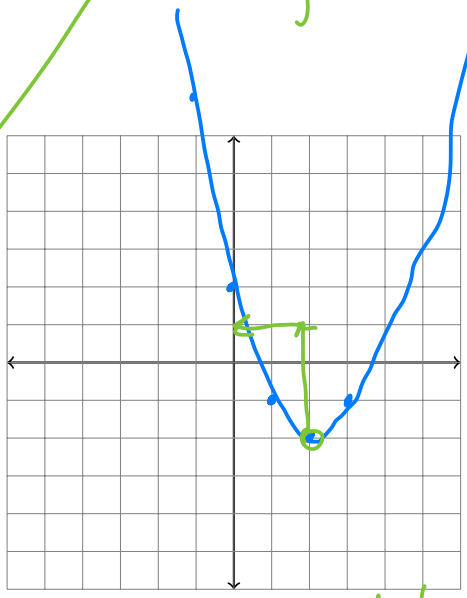
0, 1
± 1, 2
± 2, 5

0, 2
1, -1
2, -2
-1, 7
-2, 12

$(x-2)^2$

x - 3 outside,
x - 2 inside
$g(x) = f(x-2) - 3$





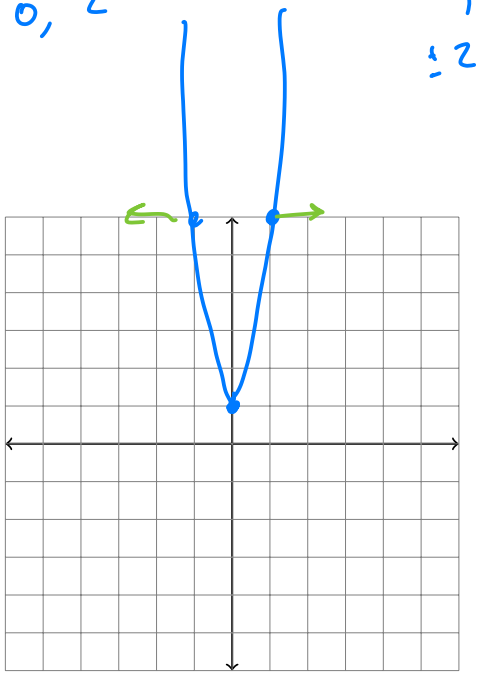
(b) $f(x) = 4x^2 + 2$, $g(x) = x^2 + 2$

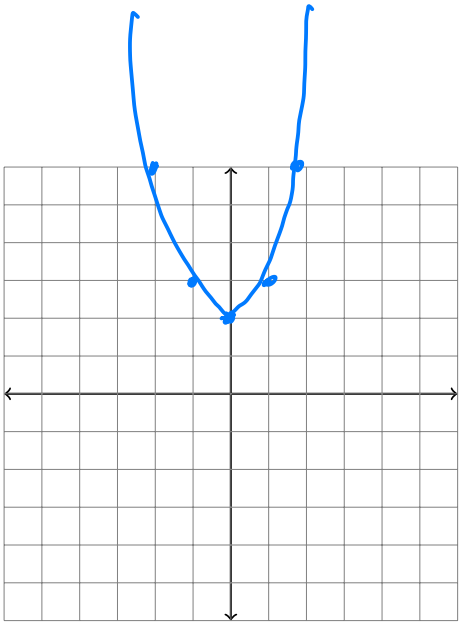
±1, 6
0, 2

0, 2
±1, 3
±2, 6

horizontal stretch by ×2

→ 2x inside
$g(x) = f(2x)$



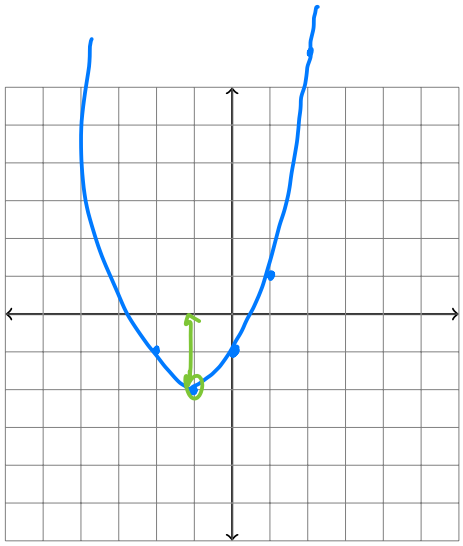


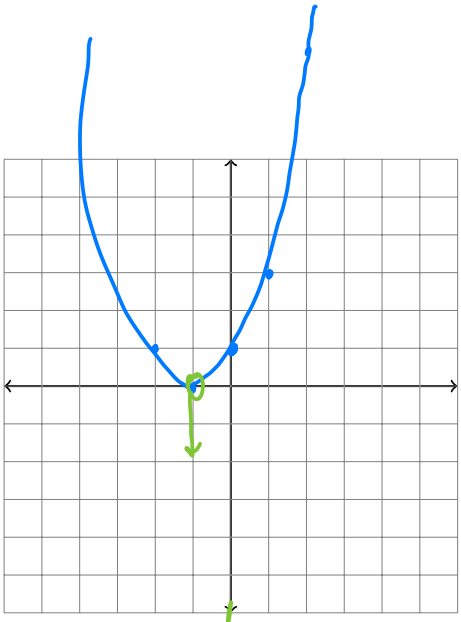
(c) $f(x) = x^2 + 2x - 1$, $g(x) = x^2 + 2x + 1$

$g(x) = f(x) + 2$

x	$f(x)$
0	-1
1	2
-1	-2
2	7
-2	-1

up 2 : outside $+2$





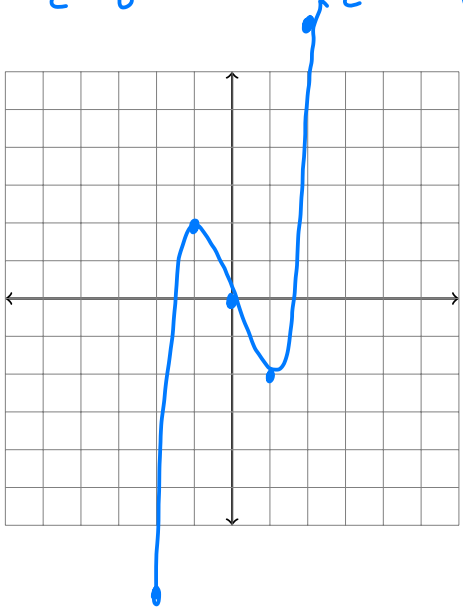
(d) $f(x) = 2x^3 - 4x$, $g(x) = x^3 - 2x$

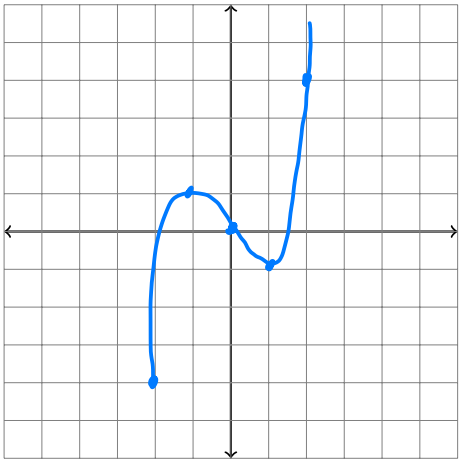
x	$f(x)$
0	0
1	-2
-1	2
2	8
-2	-8

x	$g(x)$
0	0
1	-1
-1	1
2	4
-2	-4

vertical squish by $\frac{1}{2}$ → $\frac{1}{2}$ x output

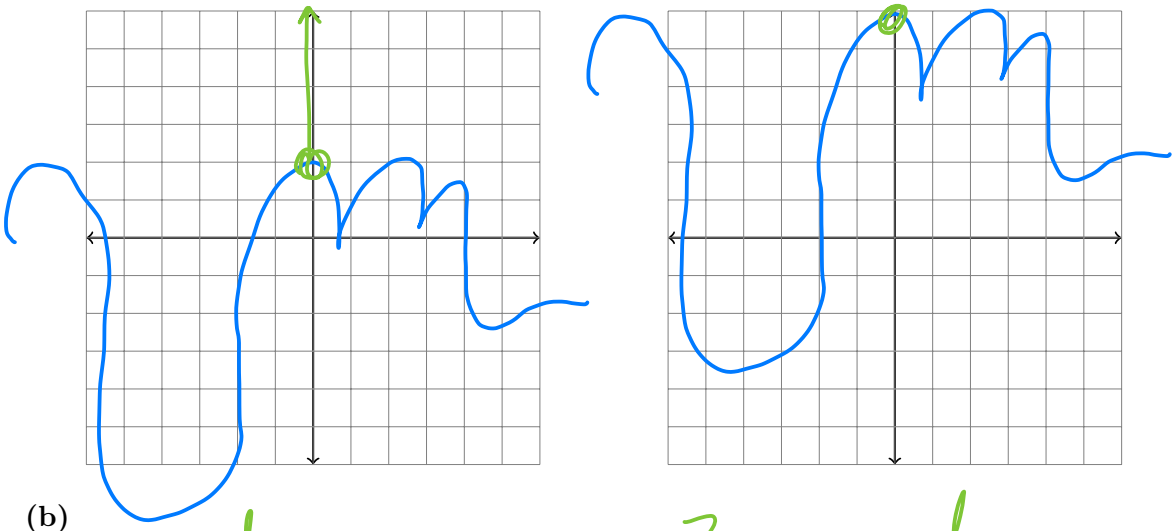
$g(x) = \frac{1}{2} f(x)$



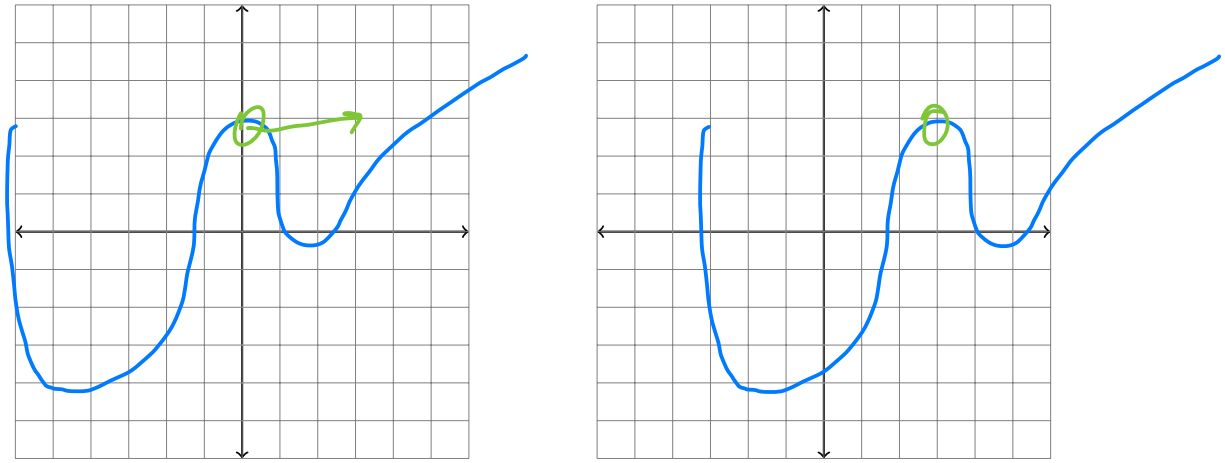


For each of the following pairs of graphs, write down a linear function which transforms one into the other:

(a) up 4 $x+4$ outside

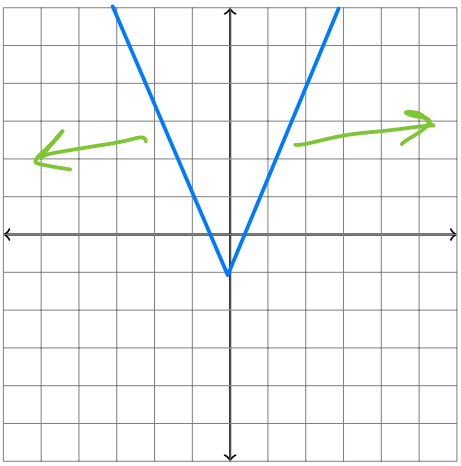


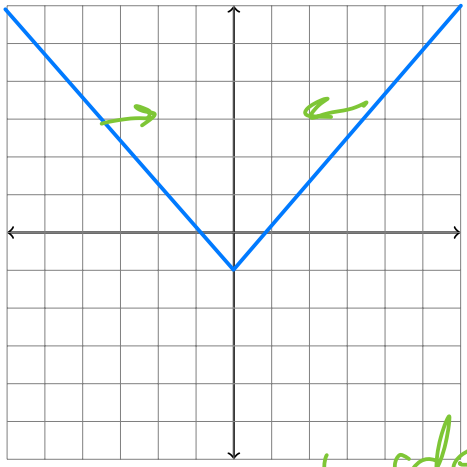
(b) right 3 : $x-3$ inside



(c) horizontal stretch by factor of 2

↪ $\frac{1}{2}\times$ inside





(d) stretch by 2 vert & horiz

$2\times$ outside

$\frac{1}{2}\times$ inside