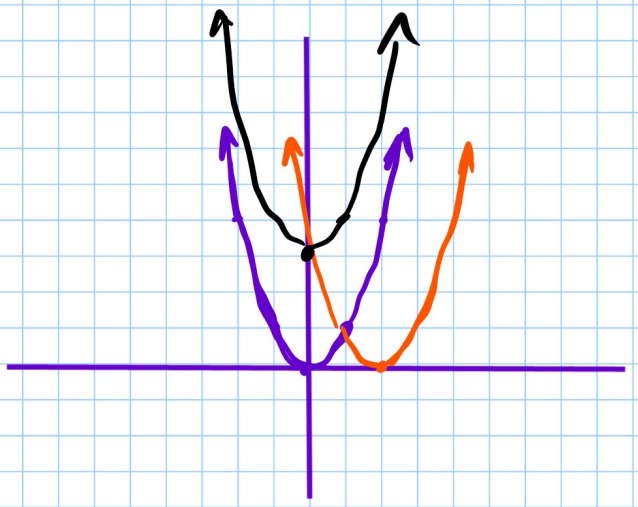
WARMUP

Graph $y = x^2$

2 right → $y = (x-2)^2$

3 up → $y = x^2 + 3$

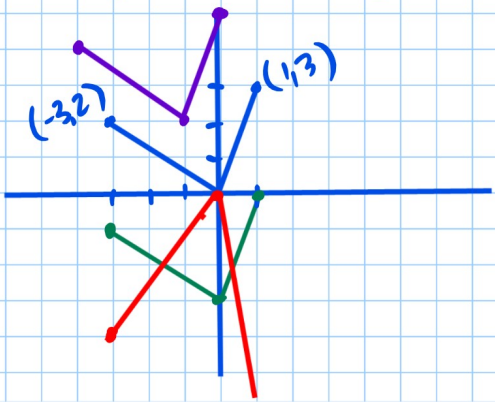
} on same axes



Section 1.3 New Functions from Old

- Multiplying a function by a constant c vertically stretches the graph if $c > 1$ and vertically shrinks the graph if $0 < c < 1$. If $c < 0$ the graph is reflected about the x-axis and either stretched or shrunk.
- If you are given $y = f(x)$ $(k > 0)$ $(h > 0)$
  - $y = f(x) + k$ shifts $f(x)$ up k units
  - $y = f(x) - k$ shifts $f(x)$ down k units
  - $y = f(x - h)$ shifts $f(x)$ right h units
  - $y = f(x + h)$ shifts $f(x)$ left h units

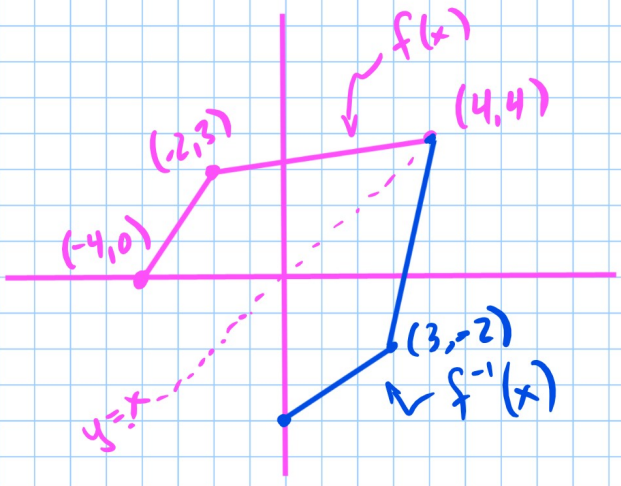
The graph of $y = f(x)$ is shown in blue.



$y = f(x) - 3$

$y = -2f(x)$ ⇒ mult y by -2

$y = f(x+1) + 2$
left 1 up 2



$f(-2) = 3$

$f^{-1}(3) = -2$

ex: $f(x) = x^2$

$g(x) = x+1$

$f(g(1)) = f(\overbrace{1+1}^{g(1)}) = f(2) = 2^2 = 4$

"composition"

$f(g(x)) = f(x+1) = (x+1)^2 = x^2+2x+1$

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

	+1	x
+1	1	x
x	x	x^2

x^2+2x+1

ex: Given $f(x) = x^2+4x-7$

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

$f(3+h) = (3+h)^2 + 4(3+h) - 7$

$= (3+h)(3+h) + 12 + 4h - 7$

$= 9 + 6h + h^2 + 12 + 4h - 7$

$= h^2 + 10h + 14$

$f(3) = 3^2 + 4\cdot 3 - 7 = 9 + 12 - 7 = 14$

$f(3+h) - f(3) = h^2 + 10h + 14 - 14 = h^2 + 10h$

p21-23 1, 4a, b, 5, 9, 15, 25, 26, 36

9) $q = f(p)$ (q: # of items sold; p: price) $\Rightarrow$ $f^{-1}(q) = p$

$f(25)$ = number of items sold when price is 25

$f^{-1}(30)$ = price when 30 items are sold