Section 12

$\boxed{\S 2.4}$

(75 minutes) 2/4

Test 1: $\underbrace{1.3-1.10}_{1/3 \text{ of test}}$, $\underbrace{2.1-2.5}_{2/3 \text{ of test}}$

- Exam Rev 1 posted, part 2 posts tonight, solutions on Tuesday

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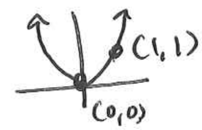
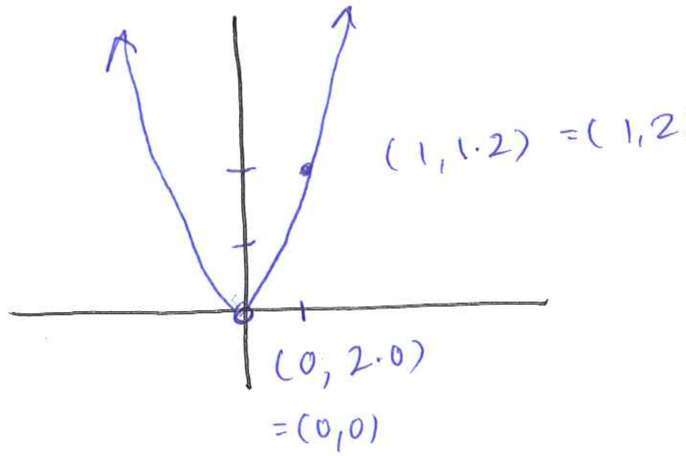
Example 1: Describe the transformation of $f(x) = y = x^2$ in the appropriate order and sketch its graph.

base: 

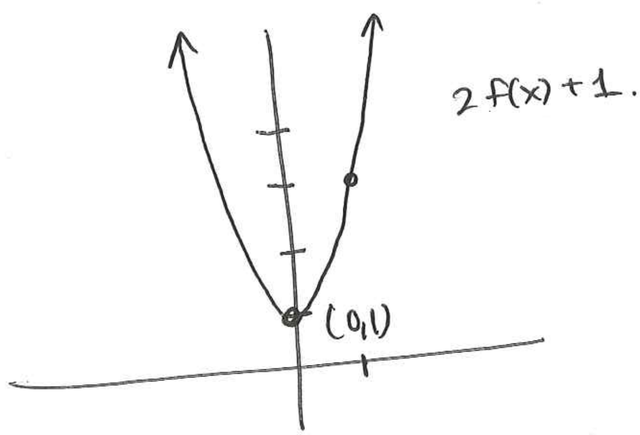
ⓐ $2f(x) + 1$

2: multiply on the outputs by 2.
① (V. stretch by 2)

$+1$: add by 1 to outputs
② (Shift ↑ 1)

① 

② Final Graph:



RECALL: inside ⟷ inputs w/ opp arith.

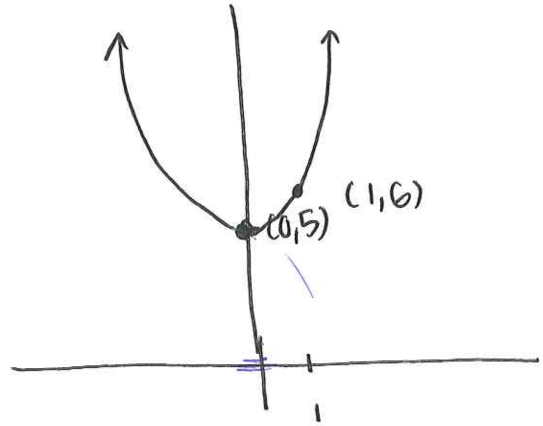
outside ⟷ outputs w/ same arith.

(b) $-(f(x)+5)$

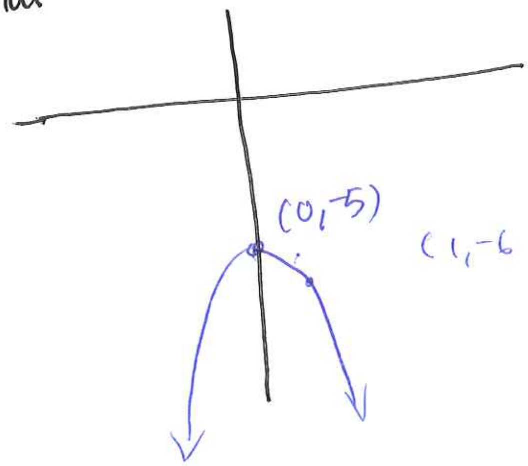
② flip over x-axis

① shift ↑ 5

①



② Final



(c) $f(\frac{1}{2}x+1)$

(Hstretch by 2)

subtract 1 from x

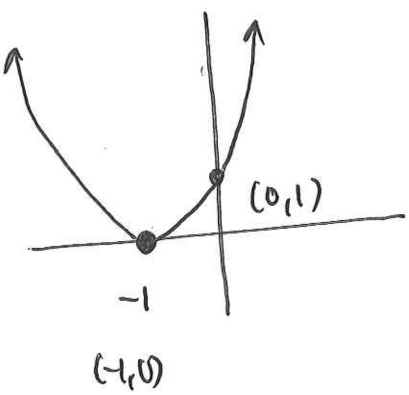
(← 1) ①

divide x vals by 1/2

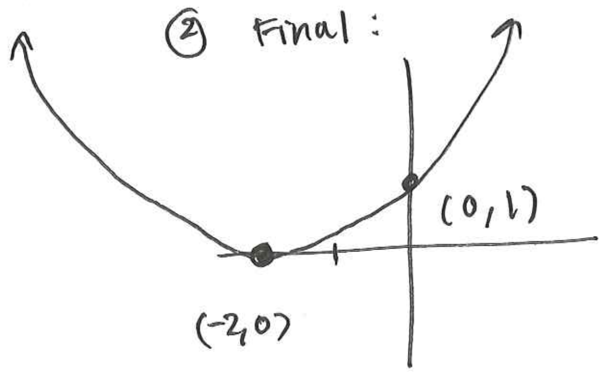
= mult x vals by 2.

②

①



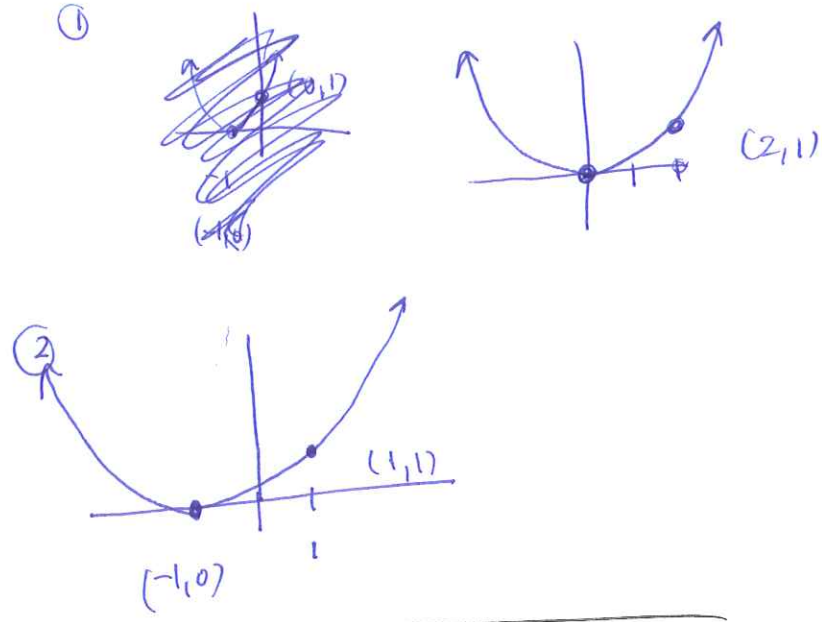
② Final :



(d) $f(\frac{1}{2}(x+1))$

① H stretch by 2

② shift L by 1



Practice: Describe in order the trans of $y=f(x)$

1.) $2f(x+3)$

V. stretch by 2

L. 3 units

order in this case doesn't matter.

2.) $-3f(2x+5)-13$

① Flip over x-axis

① V. stretch by 3

④ Hoz shrink by $\frac{1}{2}$

③ Shift L 5

② Shift ↓ 13

3.) $-2[f(-3(x+1))-11]$

④ Flip over x-axis

④ V. stretch by 2

① Flip over y-axis

① Horiz shrink by $\frac{1}{3}$

② Shift L 1

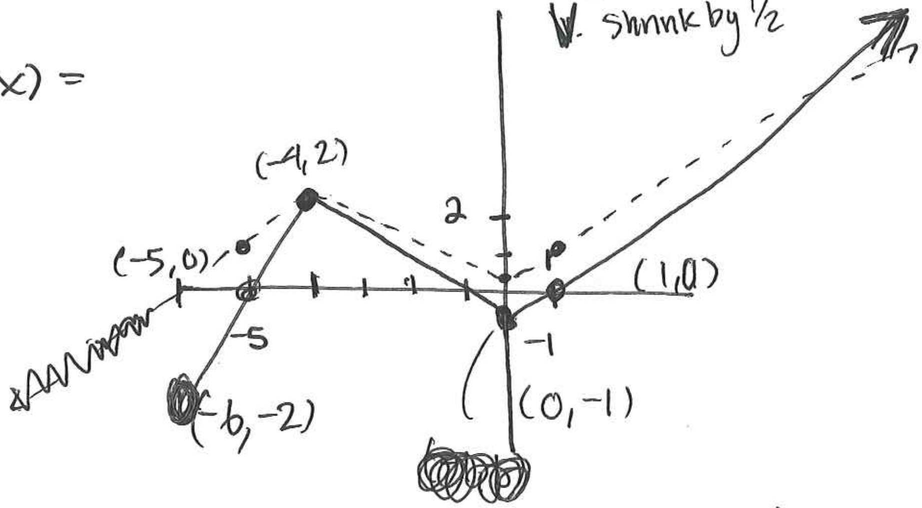
↓ 11. ③

Practice: Draw the transformation $\frac{1}{2}g(x)+1$

① shrink by 1/2 ② ↑ 1

given

$g(x) =$



Final

$(-5,0) \xrightarrow{①} (-5,0) \xrightarrow{②} (-5,1)$

$(-4,2) \xrightarrow{①} (-4,1) \xrightarrow{②} (-4,2)$

$(0,-1) \xrightarrow{①} (0,-\frac{1}{2}) \xrightarrow{②} (0,\frac{1}{2})$

$(1,0) \xrightarrow{①} (1,0) \xrightarrow{②} (1,1)$

On original	trans:
D: $[-6,\infty)$	D: $[-6,\infty)$
R: $[-2,\infty)$	R: $[0,\infty)$

Last Class: (Review of topics so far in Ch2)

- average rate of change of $f(x)$ over the interval (a,b)

$$\frac{\Delta \text{ output}}{\Delta \text{ input}} = \frac{f(b)-f(a)}{b-a}$$ = slope of line segment connecting $(a, f(a))$ to $(b, f(b))$

AROC $>0 \Rightarrow$ on average increasing

AROC $<0 \Rightarrow$ on average decreasing.

- linear functions

$$y = b + mx$$

b: y int; initial value of output (~~unit~~ (same units as y).

m: slope = constant average rate of change.

(units of m is just the ratio $\frac{\text{units of } y}{\text{units of } x}$)

- concavity

concave up = graph bends upwards = A.R.O.C. / slopes are increasing

concave down = graph bends downwards = AROC/slopes are decreasing.