Ch 13: Moving Functions Around – Shifting, Dilating and Reflecting

Entry Task: Try to draw these graphs…

(a) Draw the graph of $f(x) = |x|$.

Formula	Effect	Formula	Effect
$y = f(x) + k$	Up by k	$y = f(x - h)$	Right by h
$y = -f(x)$	Flip vertically	$y = f(-x)$	Flip horizontally
$y = a\,f(x)$	Multiply y by a	$y = f(bx)$	Multiply x by 1/b

(b) Draw the graph of $y = f(x - 1)$.

(c) Draw the graph of $y = f(x) - 2$.

(d) Draw the graph of $y = -f(x)$.

(e) Draw the graph of $y = 2f(x)$.

<u>Side Note</u>

A function is said to be “even” if $f(-x) = f(x)$.

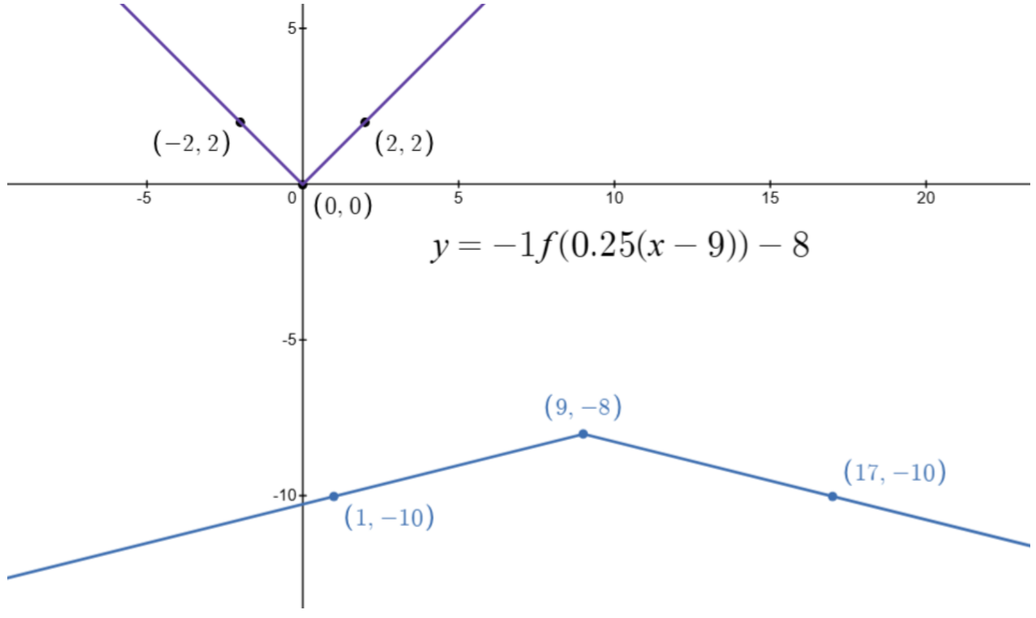
A function is said to be “odd” if $f(-x) = -f(x)$.

Once again… $y = f(x) = |x|$.

(a) Draw the graph of $y = -3f(2(x-1))$.

If multiple operations appear use

- my (x_{old}, y_{old}) to (x_{new}, y_{new}) method and plot points (I'll show you now!).
- Or use "standard form" (*dilating comes first*):
  - $y = af\big(b(x-c)\big) + d$
- Or replace in order like the book.



https://www.desmos.com/calculator/d15ic8semm

Example: Shifting and Dilating Quadratics

Consider

$$y = f(x) = x^2$$

What do the following look like…

(a) $y = f(x + 2)$

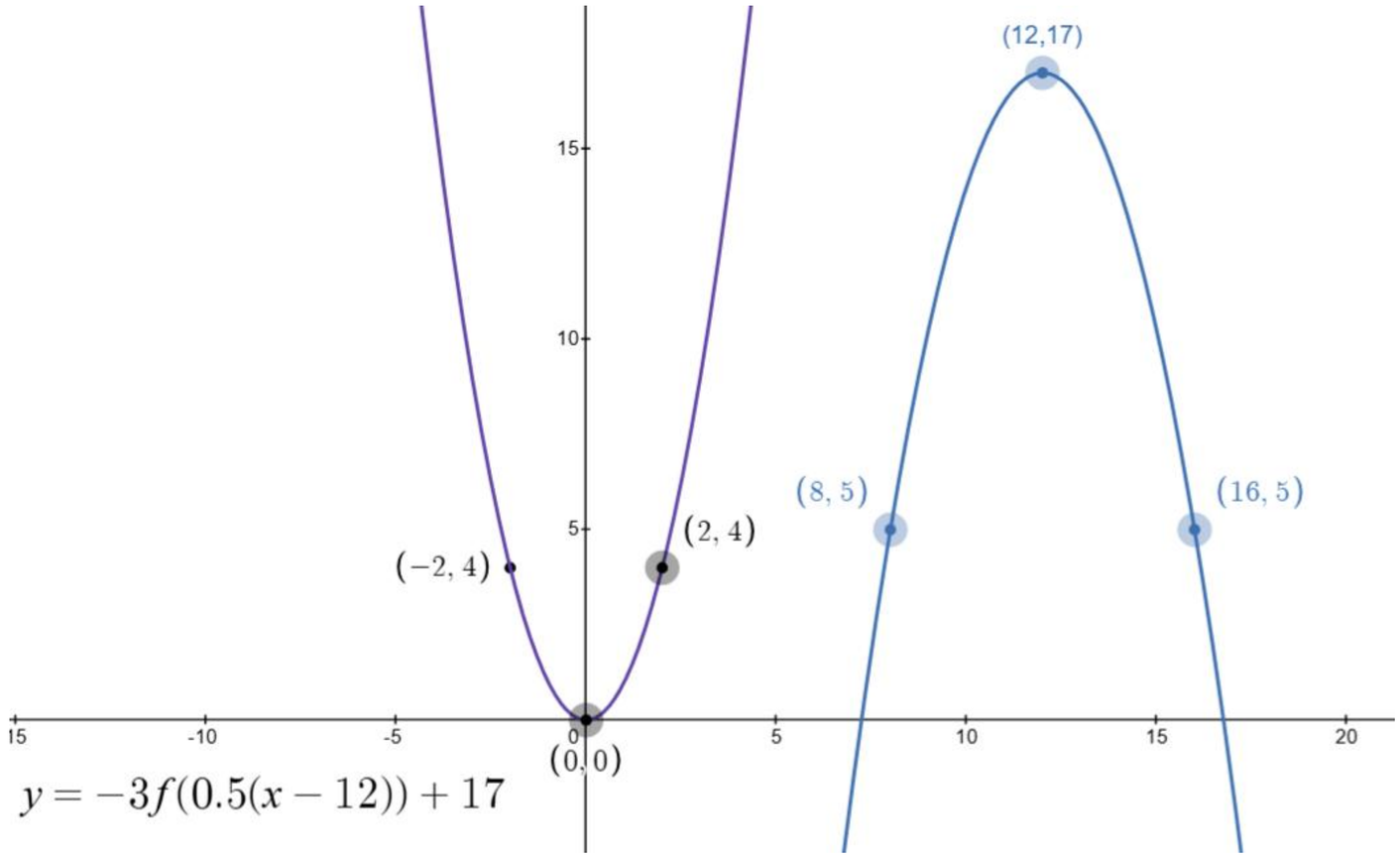
(b) $y = -f(x) + 3$

(c) $y = -3f\left(\frac{1}{2}x\right)$

(d) $y = -3f\left(\frac{1}{2}(x - 12)\right) + 17$

Here is a visual of that last example…

$$y = -3f\left(\frac{1}{2}(x-12)\right) + 17$$



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Example: Shifting and Dilating Exponentials

Consider

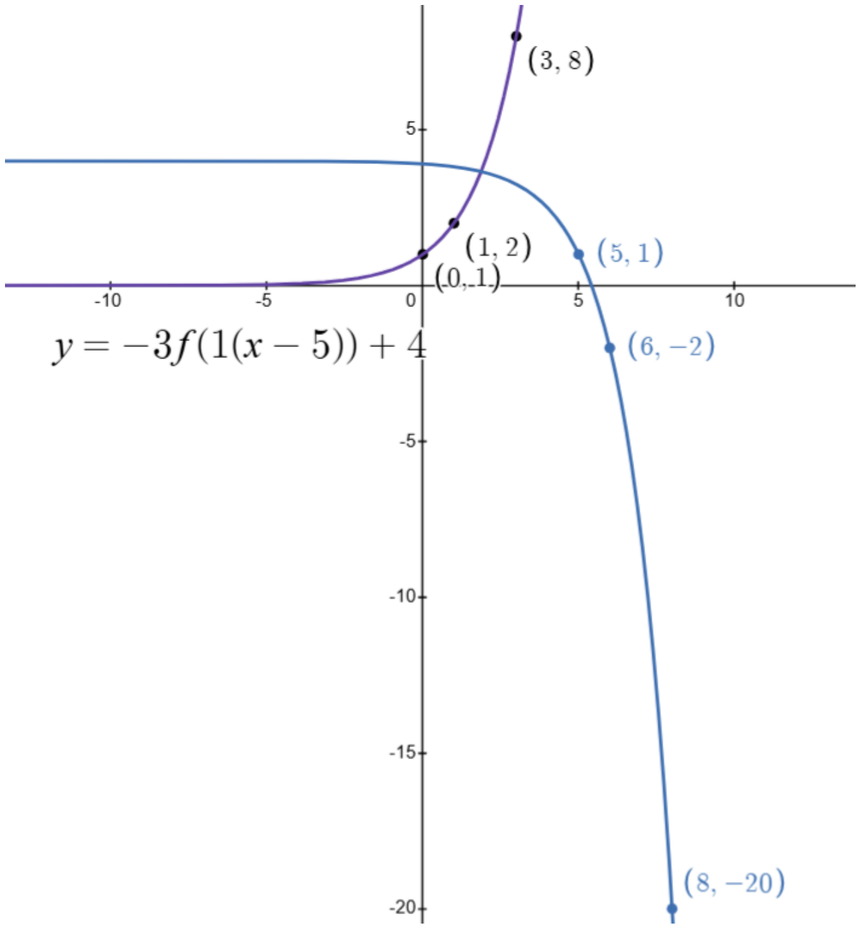
$$y = f(x) = 2^x$$

What do the following look like…

(a) $y = 3f(x)$

(b) $y = f(-x) + 3$

(c) $y = -3f(x-5) + 4$



Example: Shifting and Dilating Lines

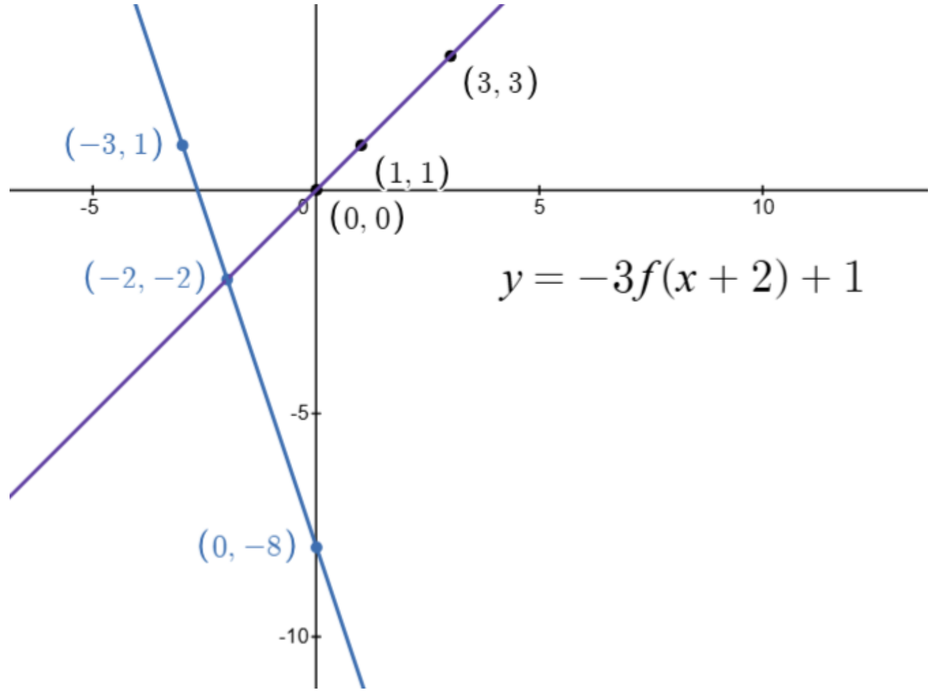
Consider

$$y = f(x) = x$$

What do the following look like…

(a) $y = 2f(x-3)+4$

(b) $y = -3f(x+2)+1$



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Example: Shifting and Dilating Circles

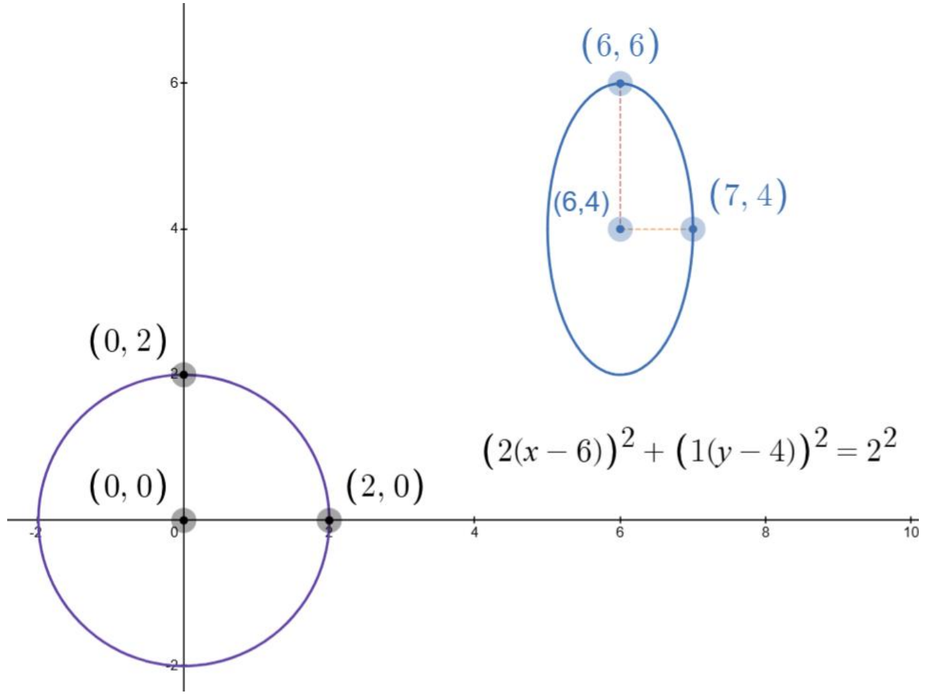
Consider

$$x^2 + y^2 = 4$$

What do the following look like…

(a) $(x-5)^2 + (y+3)^2 = 4$

(b) $(2(x-6))^2 + (y-4)^2 = 4$



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