

Agenda: Quiz ~~#4?~~ #3? (Friday!)

Sections: 1.5, 1.6a, 1.6b

Linear models

Transformations

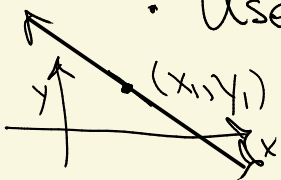
1.5 Linear Models

• Have some physical situation $\xrightarrow{\text{Produce}}$ $f(x)$

• Take data and produce points

$$\{ \underline{(x_1, y_1)}, (x_2, y_2), \dots \}$$

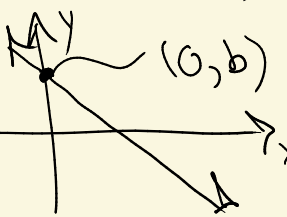
• Use 2 pieces of info to form a line



1) point-slope $\rightsquigarrow y - y_i = m(x - x_i)$

$i=1 \text{ or } 2 \text{ or } \dots$

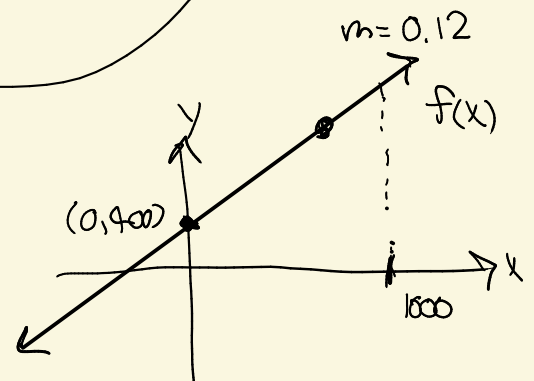
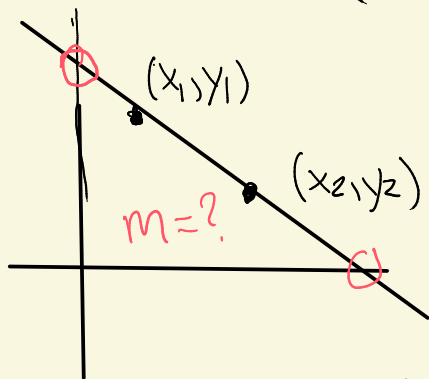
variables numbers



2) slope-intercept $\rightsquigarrow y = mx + b$

3) point-point? $\rightsquigarrow y - y_i = \frac{y_2 - y_1}{x_2 - x_1} (x - x_i)$

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$



• Interpretation
 $f(1000) = ?$

Shifting

$c \cdot f(\underbrace{\quad}_{\text{inside}}) + \underbrace{\quad}_{\text{outside}}$

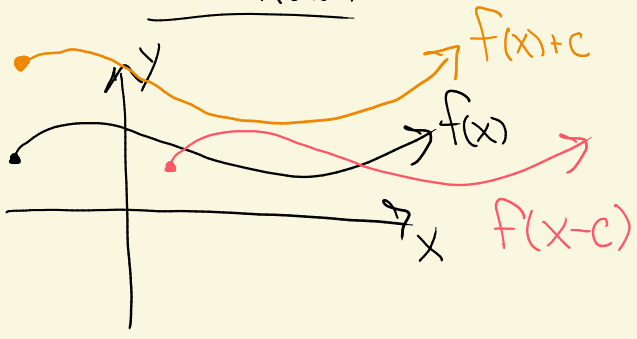
$d \in \mathbb{R}$
 $d \neq 0, d > 1$

$c \in \mathbb{R}$
 $c > 0$

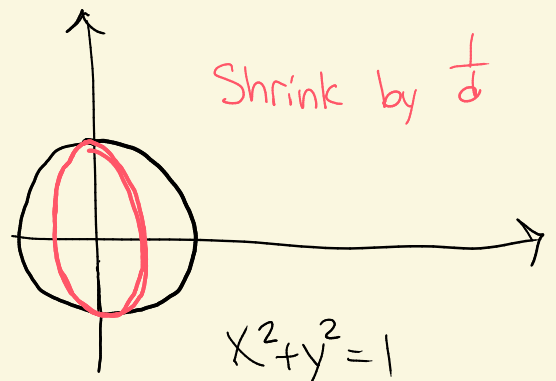
⚠ Tricky
"Inside"

	Translate	Dilation
"Inside"	$f(\underline{\underline{x+c}})$	$f(\underline{\underline{d \cdot x}})$
"Outside"	$f(x) + \underline{\underline{c}}$	$\underline{\underline{d}} \cdot f(x)$

Translation

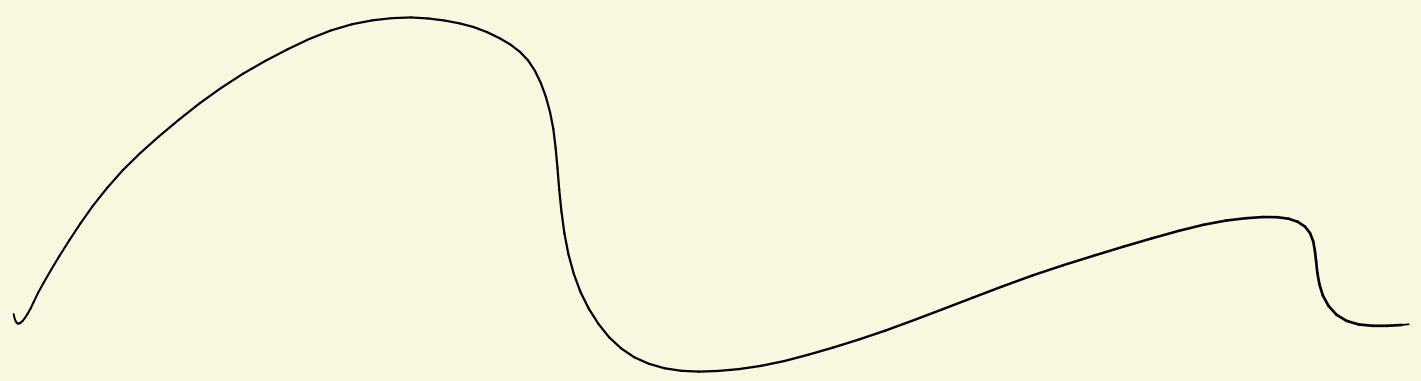


Dilation

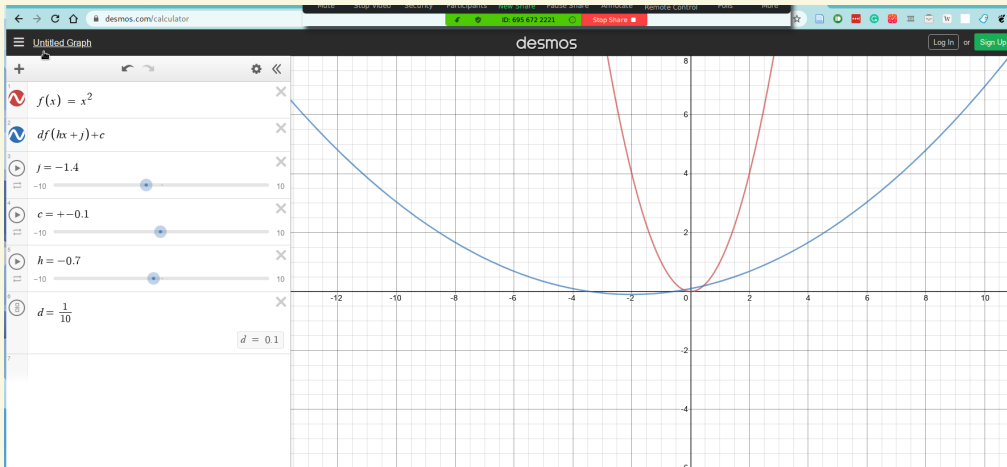


Ex $f(x) = \sqrt{x}$

Graph $5 \cdot f(3x+2) - 2$



See desmos.com! Play with parameters.



- Review: How do the domains and ranges of transformed functions change?

Eg: $f(x) = \sqrt{x}$ $\text{dom}(f) = [0, \infty)$ Should know
 $\text{range}(f) = [0, \infty)$

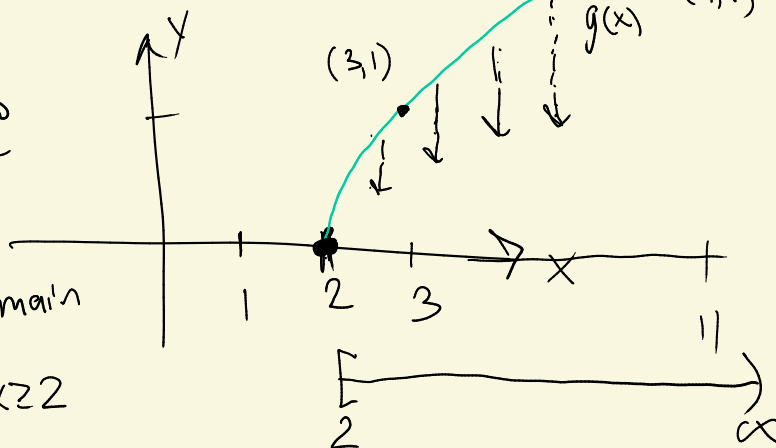
Q. What are the domain and range of

$3 \cdot \sqrt{x-2}$ (and graph)

$x-2=9$
 $\Rightarrow x=11$

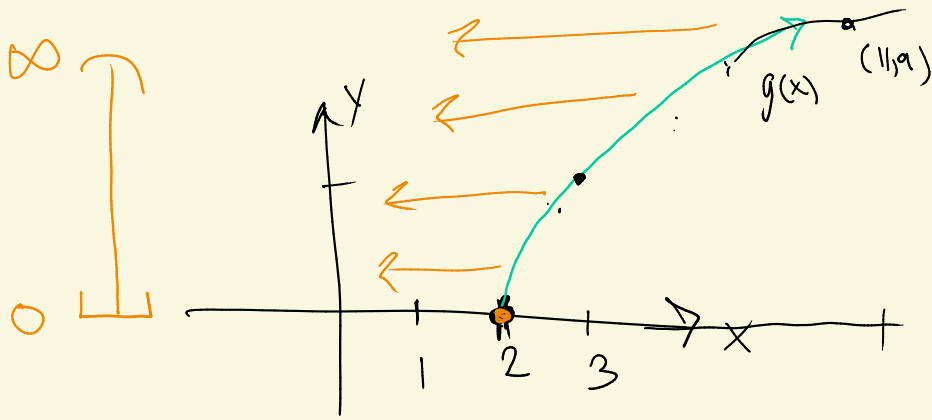
$x-2 < 0$ Throw out
 $x < 2$

$[2, \infty)$ domain is
 $x \geq 2$



- Plot some points
 $f(2)? \rightarrow (2,0)$
 $f(3)? \rightarrow (3,1)$
 $f(11) \rightarrow (11,9)$

$\text{dom}(g) = [2, \infty)$



$$\text{range}(g) = [0, \infty)$$

What functions do we have?

$$f_1(x) = x, \quad f_2(x) = x^2, \quad f_3(x) = x^3$$

$$g_1(x) = \frac{1}{x}$$

$$h_2(x) = \sqrt{x}, \quad h_3(x) = \sqrt[3]{x}$$

$$j(x) = |x|$$