Writing Equations of Graphs with Dilations Notes

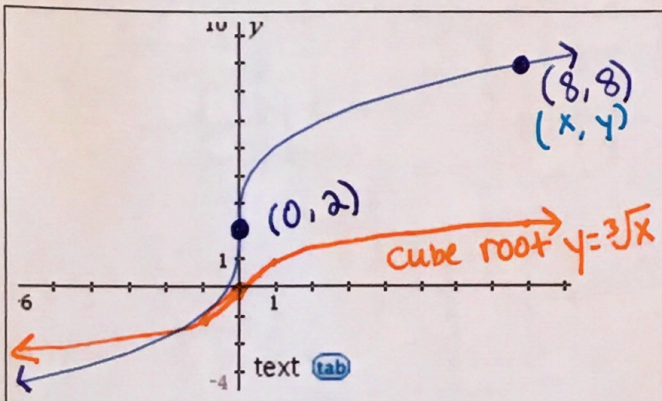
$$y = a \cdot f(x - h) + k$$

a: Dilation (negative if reflection over x-axis) **f:** Parent function **h:** horizontal translation **k:** vertical translation

Steps:

1) Identify function family
2) Identify h, k, any reflections and write partial equation
3) Solve for "a" by plugging in (x, y)
4) Write equation!

Examples:



Transformations:
up 2, Stretch by 3

up 2

$y = a\sqrt[3]{x} + 2$

$8 = a\sqrt[3]{8} + 2$

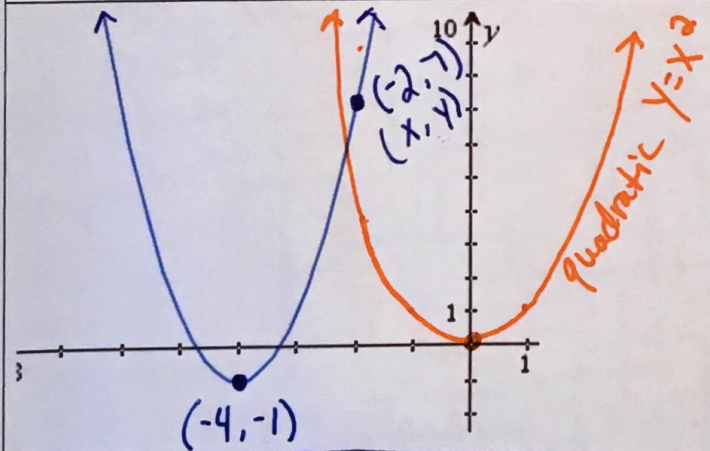
$8 = 2a + 2$

$-2 \quad -2$

$\frac{6 = 2a}{2}$

$3 = a$

$y = 3\sqrt[3]{x} + 2$



Transformations:
Left 4, down 1, Stretch by 2

Left 4, down 1

$y = a(x+4)^2 - 1$

$-1 = a(-2+4)^2 - 1$

$-1 = a(2)^2 - 1$

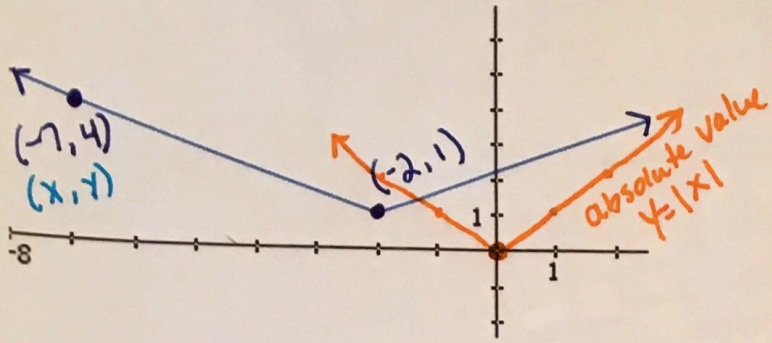
$-1 = 4a - 1$

$+1 \quad +1$

$\frac{0 = 4a}{4}$

$0 = a$

$y = 2(x+4)^2 - 1$



Left 2, up 1

$y = a|x+2|+1$

$4 = a|-7+2|+1$

$4 = a|-5|+1$

$4 = 5a + 1$

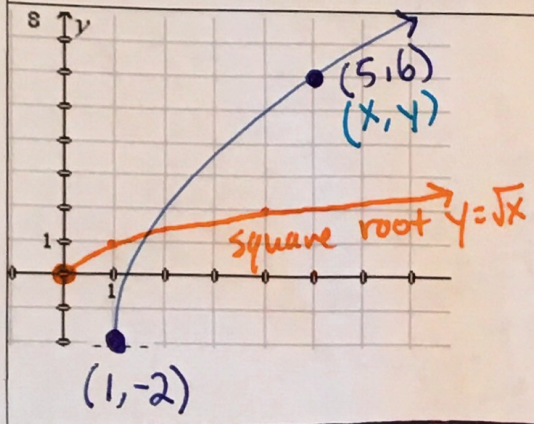
$-1 \quad -1$

$\frac{3 = 5a}{5}$

$3/5 = a$

Transformations:
Left 2, up 1, Compress by 3/5

$y = \frac{3}{5}|x+2|+1$



Right 1, Down 2

$y = a\sqrt{x-1} - 2$

$6 = a\sqrt{5-1} - 2$

$6 = a\sqrt{4} - 2$

$6 = 2a - 2$

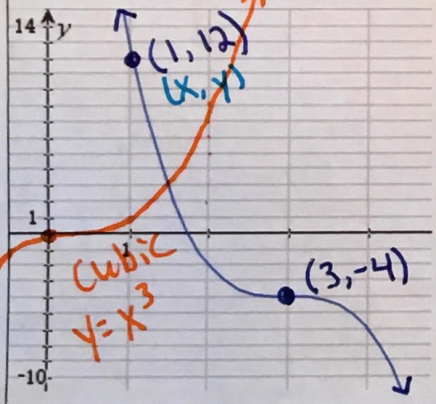
$+2 \quad +2$

$\frac{8 = 2a}{2}$

$4 = a$

Transformations:
Right 1, Down 2, Stretch by 4

$y = 4\sqrt{x-1} - 2$



Reflect over x-axis, right 3, down 4

$y = a(x-3)^3 - 4$

$12 = a(1-3)^3 - 4$

$12 = a(-2)^3 - 4$

$12 = -8a - 4$

$+4 \quad +4$

$\frac{16 = -8a}{-8}$

$-2 = a$

Transformations:
Reflection over the x-axis, Right 3, Down 4, Stretch 2

$y = -2(x-3)^3 - 4$