Exponential Form:

$$y = b^x$$

Parent function

Graph both functions. Compare your results.

Parent Function

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

$y = 2^x$

X		Y
-2	2^{-2}	.25
-1	2^{-1}	.5
0		1
1	2^1	2
2	2^2	4

$y = 3 \cdot 2^x$

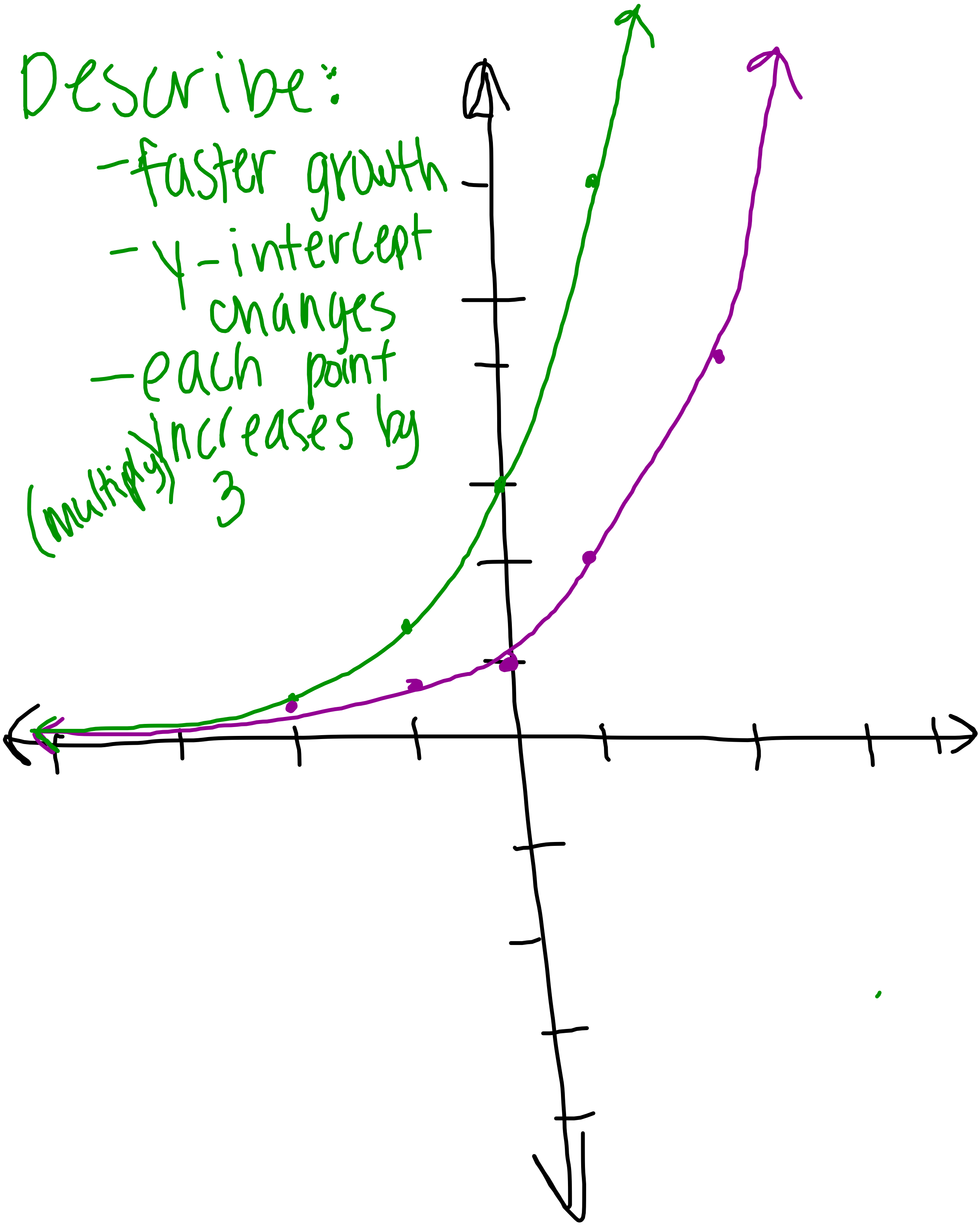
X		Y
-2	$3 \cdot 2^{-2}$	.75
-1	$3 \cdot 2^{-1}$	1.5
0	$3 \cdot 2^0$	3
1	$3 \cdot 2^1$	6
2	$3 \cdot 2^2$	12

(-2, .25) (-1, .5)
(0, 1) (1, 2) (2, 4)

(-2, .75) (-1, 1.5)
(0, 3) (1, 6) (2, 12)

Describe:

- faster growth
- y-intercept changes
- each point (multiply) increases by 3



$y = -\frac{1}{3} \cdot 3^x$ compare to the graph of the parent function

$y = 3^x$

X		Y
-2	3^{-2}	0.1
-1	3^{-1}	.3
0	3^0	1
1	3^1	3
2	3^2	9

(-2, 0.1) (-1, 0.3)
(0, 1) (1, 3) (2, 9)

$y = -\frac{1}{3} \cdot 3^x$

X		Y
-2		-0.03
-1		-0.1
0		-0.3
1		-1
2		-3

(-2, -0.03) (-1, -0.1)
(0, -0.3) (1, -1)
(2, -3)

Describe:

- opposite directions
- 1 more visible point on graph
- almost a mirror

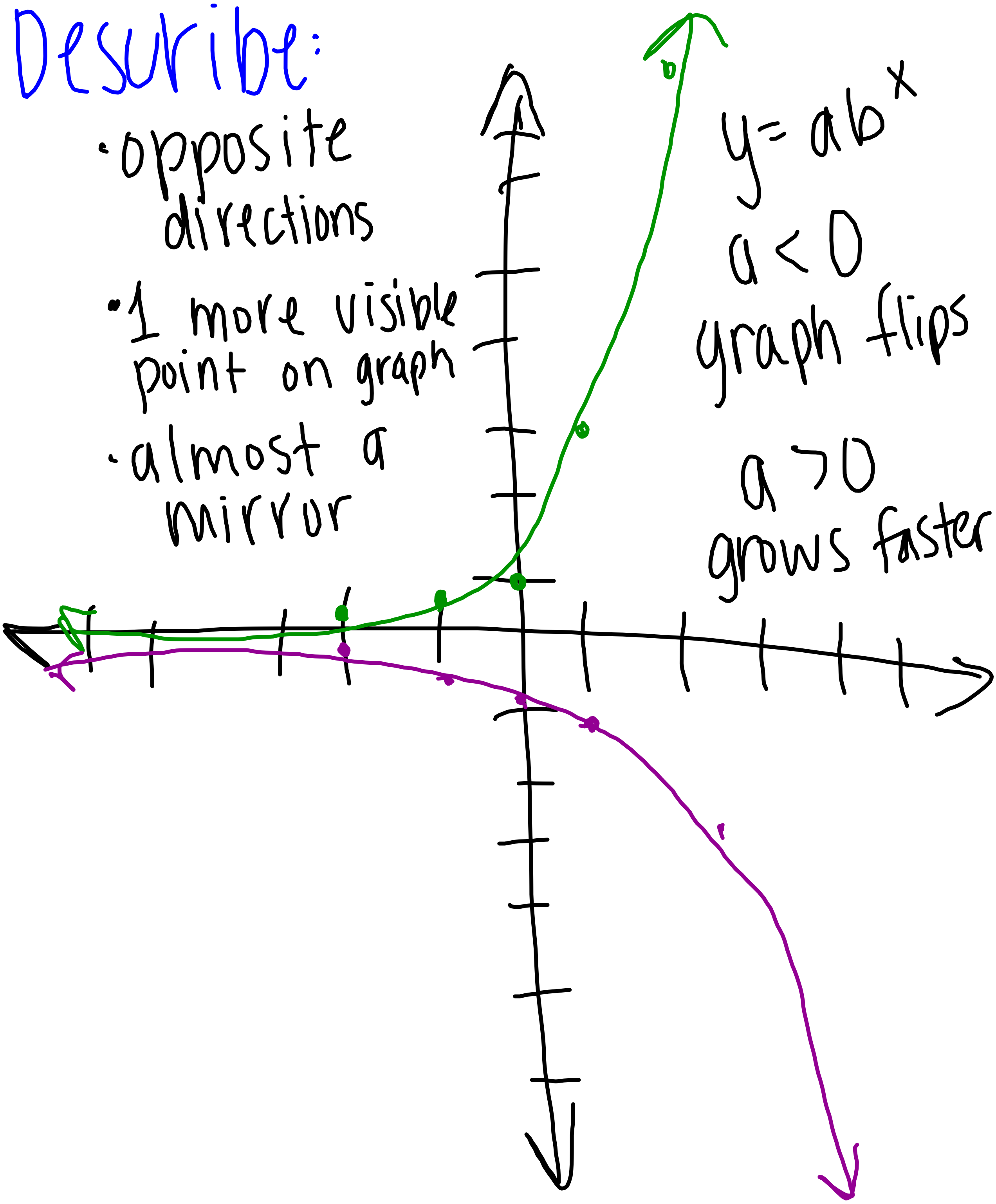
$y = ab^x$

$a < 0$

graph flips

$a > 0$

grows faster



$$y = (\frac{1}{2})4^x$$

A horizontal shift $y = ab^{(x-h)}$ is the same as the vertical stretch or compression $y = (ab^{-h})b^{x}$. A vertical shift $y = ab^{x} + k$ also shifts the horizontal asymptote from $y = 0$ to $y = k$.

$y = 2^{(x-4)}$

$$y = 20\left(\frac{1}{2}\right)^x + 10$$