8.5b Warm-Up:

1. Write an example of an exponential function.

2. Make a table to find five points for the graph of your function.

Graph the functions $y = 3 \cdot 2^x$ and $y = -3 \cdot 2^x$. Compare each graph with the graph of $y = 2^x$.

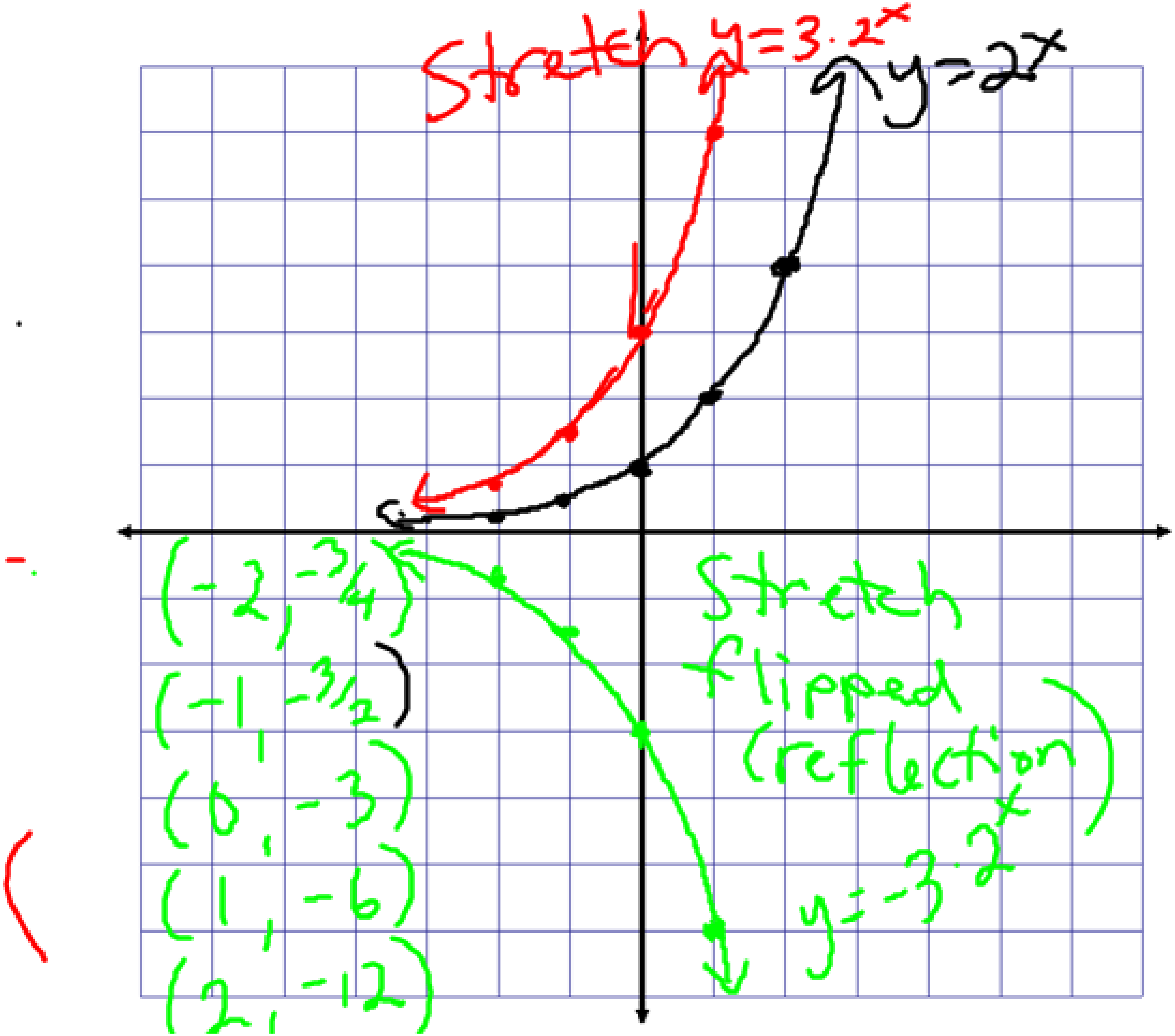
$y = 2^x$

| $x$ | $y = 2^x$ | $y = 3 \cdot 2^x$ | $y = -3 \cdot 2^x$ |
|---|---|---|---|
| $-2$ | $1/4$ | $\frac{3}{1} \cdot \frac{1}{4} = \frac{3}{4}$ | $-3/4$ |
| $-1$ | $1/2$ | $3 \cdot \frac{1}{2} = \frac{3}{2}$ | $-3/2$ |
| $0$ | $1$ | $3 \cdot 1 = 3$ | $-3$ |
| $1$ | $2$ | $3 \cdot 2 = 6$ | $-6$ |
| $2$ | $4$ | $3 \cdot 4 = 12$ | $-12$ |

$(-2, -3/4)$
$(-1, -3/2)$
$(0, -3)$
$(1, -6)$
$(2, -12)$

$y = 3 \cdot 2^x$

$(-2, 3/4)$ $(-1, 3/2)$ $(0, 3)$
$(1, 6)$ $(2, 12)$



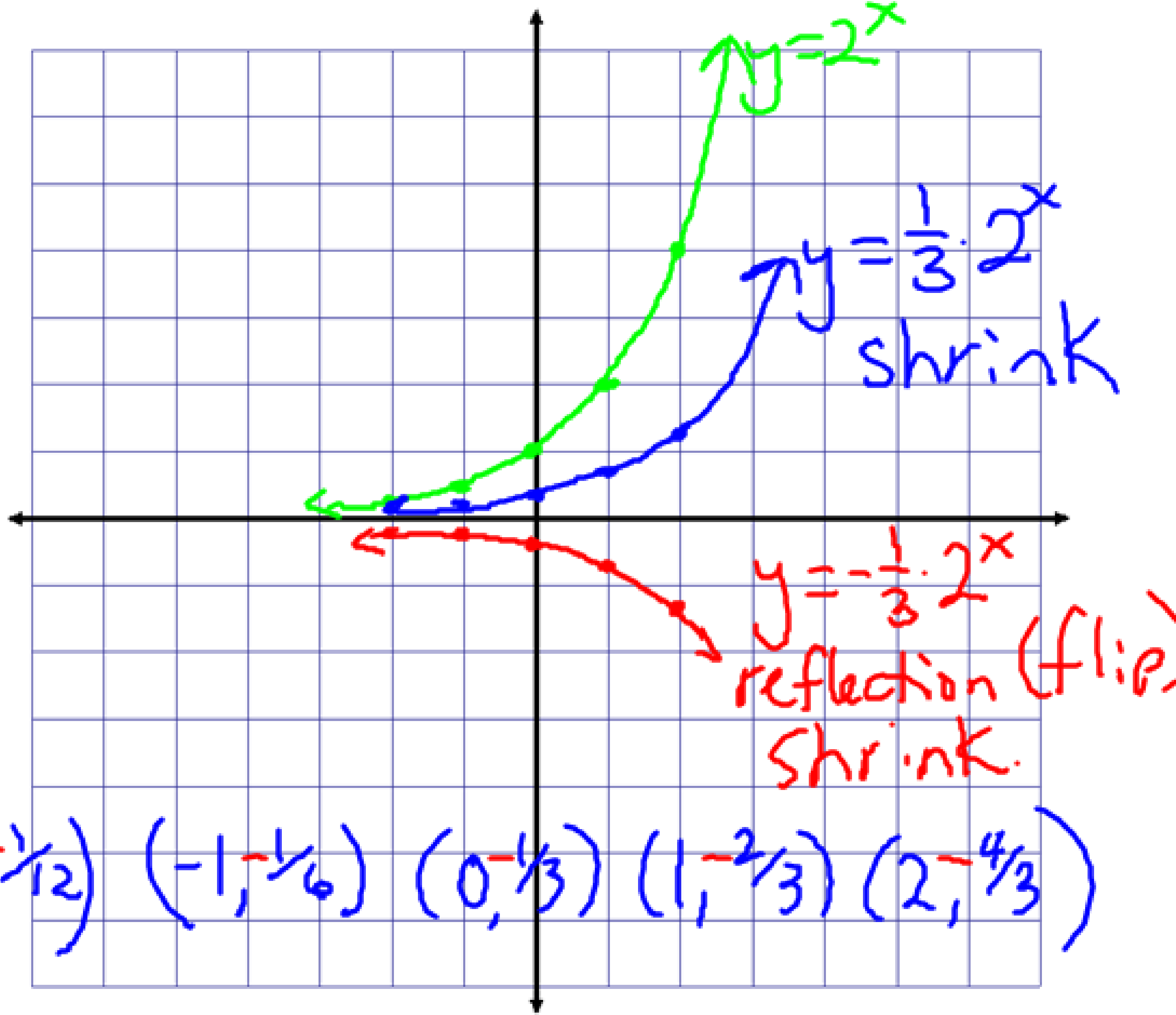
Stretch $y=3\cdot 2^x$
$y=2^x$
$(-2, -3/4)$
$(-1, -3/2)$
$(0, -3)$
$(1, -6)$
$(2, -12)$
Stretch
flipped
(reflection)
$y=-3\cdot 2^x$

Graph $y = -\frac{1}{3} \cdot 2^x$. Graph $y = \frac{1}{3} \cdot 2^x$. Compare the graph with the graph of $y = 2^x$.

| $x$ | $y = 2^x$ | $y = \frac{1}{3} \cdot 2^x$ | $y = -\frac{1}{3} \cdot 2^x$ |
|---|---|---|---|
| −2 | $\frac{1}{4}$ | $\frac{1}{3} \cdot \frac{1}{4} = \frac{1}{12}$ | $-\frac{1}{12}$ |
| −1 | $\frac{1}{2}$ | $\frac{1}{3} \cdot \frac{1}{2} = \frac{1}{6}$ | $-\frac{1}{6}$ |
| 0 | 1 | $\frac{1}{3} \cdot 1 = \frac{1}{3}$ | $-\frac{1}{3}$ |
| 1 | 2 | $\frac{1}{3} \cdot 2 = \frac{2}{3}$ | $-\frac{2}{3}$ |
| 2 | 4 | $\frac{1}{3} \cdot 4 = \frac{4}{3}$ | $-\frac{4}{3}$ |

$(-2, \frac{1}{4})$ $(-1, \frac{1}{2})$ $(0, 1)$ $(1, 2)$ $(2, 4)$

$(-2, \frac{1}{12})$ $(-1, \frac{1}{6})$ $(0, \frac{1}{3})$ $(1, \frac{2}{3})$ $(2, \frac{4}{3})$

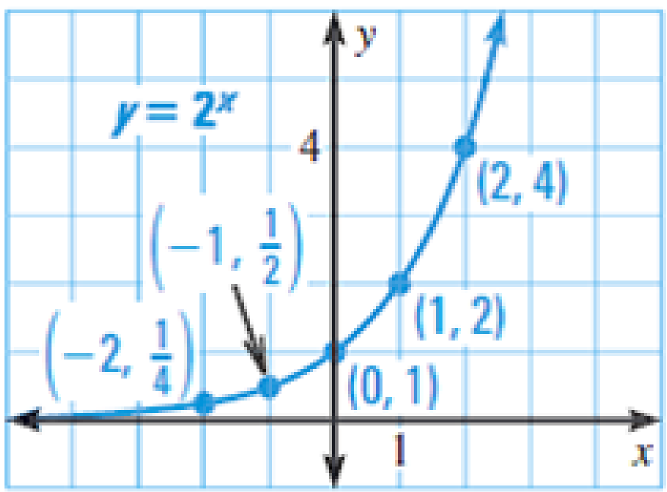



$(-2, -\frac{1}{12})$ $(-1, -\frac{1}{6})$ $(0, -\frac{1}{3})$ $(1, -\frac{2}{3})$ $(2, -\frac{4}{3})$

Most of the graphs and functions that we have looked at today and last time have something in common.

Functions that grow exponentially are called exponential growth functions.

(Look at last times homework problems for tips.)



## Exponential Growth Model

$a$ is the initial value (starts).

$r$ is the rate

$$y = a\underbrace{(1 + r)}^{t}$$

$1 + r$ is the

$t$ is the time

growth rate

**COLLECTOR CAR** The owner of a 1953 Hudson Hornet convertible sold the car at an auction. The owner bought it in 1984 when its value was \$11,000. The value of the car increased at a rate of 6.9% per year.

a. Write a function that models the value of the car over time.

b. The auction took place in 2004. What was the approximate value of the car at the time of the auction? Round your answer to the nearest dollar.

c. What would the car sell for in 2012?

$y = a(1+r)^t$

$a = 11,000$

$r = .069$

$y = 11,000(1 + .069)^t$

$t = 2004 - 1984 = 20$

$y = 11000(1.069)^{20}$

$y = \$41,778$

c. $y = 11000(1.069)^{28}$

$= \$71,247.$

You put \$250 in a savings account that earns 4% annual interest compounded yearly. You do not make any deposits or withdrawals. How much will your investment be worth in 5 years?

$$y = a(1+r)^t$$

$$= 250(1+.04)^5 = \$304.16$$

How much will your investment be worth in 10 years?

$$y = 250(1.04)^{10} = \$370.06$$

How much will your investment be worth in 10 years at 1.5% rate?

$$y = 250(1+.015)^{10}$$

$$= 250(1.015)^{10} \approx \$290.13$$

Homework:

p 524-6

#'s 22-34 E, 38a-d, 52-60 E

| $x$ | $y=3^x$ |
|---|---|
| $-2$ | $1/9$ |
| $-1$ | $1/3$ |
| $0$ | $1$ |
| $1$ | $3$ |
| $2$ | $9$ |