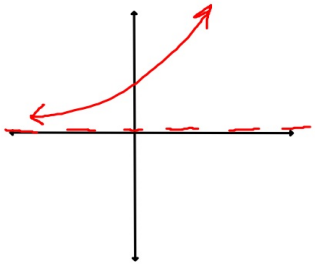
## 8.1/8.2 Graphing Exponential Functions

std. 12.0

**equation** $y = ab^x$ , $b > 0$, $b \neq 1$, $a \neq 0$

***exponential growth***

$y = ab^x$ , $a > 0$, $b > 1$



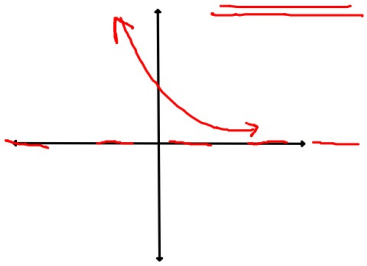
***asymptote:*** $y = 0$

***domain:*** all reals

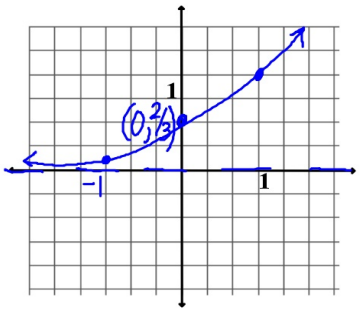
***range:*** $y > 0$

***exponential decay***

$y = ab^x$ , $a > 0$, $0 < b < 1$

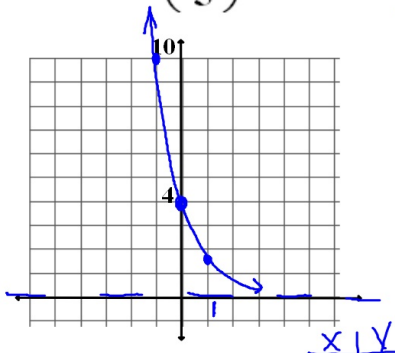


**ex. 1** $y = \frac{2}{3} \cdot 2^x$ (a = $\frac{2}{3}$, b = 2) growth




| x | y |
|---|---|
| 0 | $\frac{2}{3}$ |
| 1 | $1\frac{1}{3}$ |
| -1 | $\frac{1}{3}$ $\frac{2}{3} \cdot \frac{1}{2}$ |

**ex. 2** $y = 4\left(\frac{2}{5}\right)^x$ (a = 4, b = $\frac{2}{5}$) decay.




| x | y |
|---|---|
| 0 | 4 |
| 1 | $1\frac{3}{5}$ |
| -1 | 10 $4 \cdot \frac{5}{2}$ |

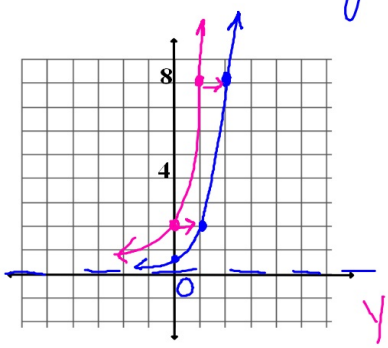
**general equation:** $y = ab^{x-h} + k$ , $b > 0$, $b \neq 1$, $a \neq 0$

*k = vertical shift for asymptote*

**ex. 3** $y = 2 \cdot 4^{x-1}$

b  h>0 →

growth




| x | y |
|---|---|
| 0 | $\frac{1}{2}$ = 2·$\frac{1}{4}$ |
| 1 | 2 2·1 |
| 2 | 8 |

$y = 2 \cdot 4^x$

| x | y |
|---|---|
| 0 | 2 |
| 1 | 8 |
| 2 | 32 |

**ex. 4** $y = 5\left(\frac{1}{2}\right)^{x+1} - 2$

b  decay


| x | y |
|---|---|
| 0 | 1½ |
| -1 | 3 |
| -2 | 8 5·2-2 |

y = -2

$y = 5\left(\frac{1}{2}\right)^x - 2$

| x | y |
|---|---|
| 0 | 3 |