4.1: Exponential Functions (growth and decay)

If you have a scientific calculator, bring it tomorrow.

Don't forget about the online assignment due tomorrow 3 pm

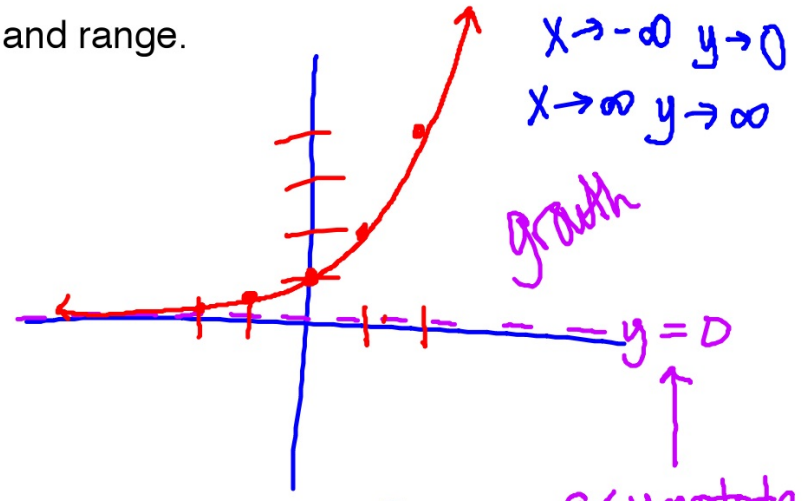
$$f(x) = a \cdot b^x$$

$a \neq 0$ $\quad$ $b > 0; x \neq 1$

Sketch. State the domain and range.

$y = 2^x$

x	y
−2	$2^{-2} = 1/4$
−1	$2^{-1} = 1/2$
0	1
1	2
2	4



D: $(-\infty, \infty)$

R: $(0, \infty)$

- functions approach the asymptotes for $x \to \infty$ and $x \to -\infty$

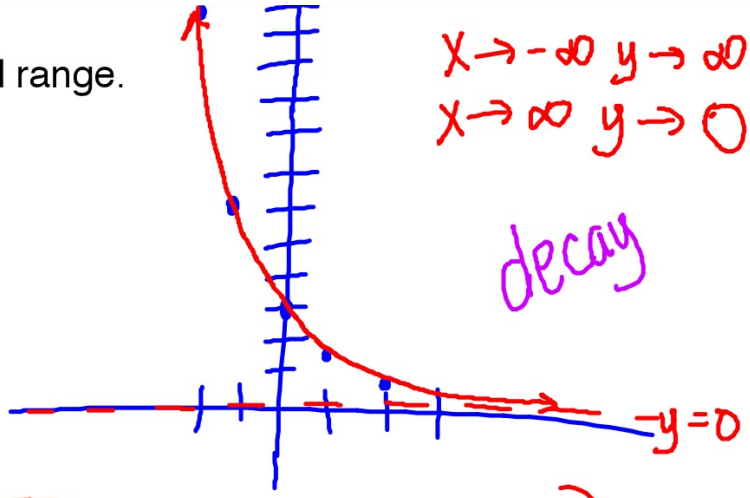
Sketch. State domain and range.

$y = 3\left(\frac{1}{2}\right)^x$

x	y
−2	12
−1	6
0	3
1	3/2
2	3/4

$3(2)^2$

y-int.



$x \to -\infty \quad y \to \infty$

$x \to \infty \quad y \to 0$

decay

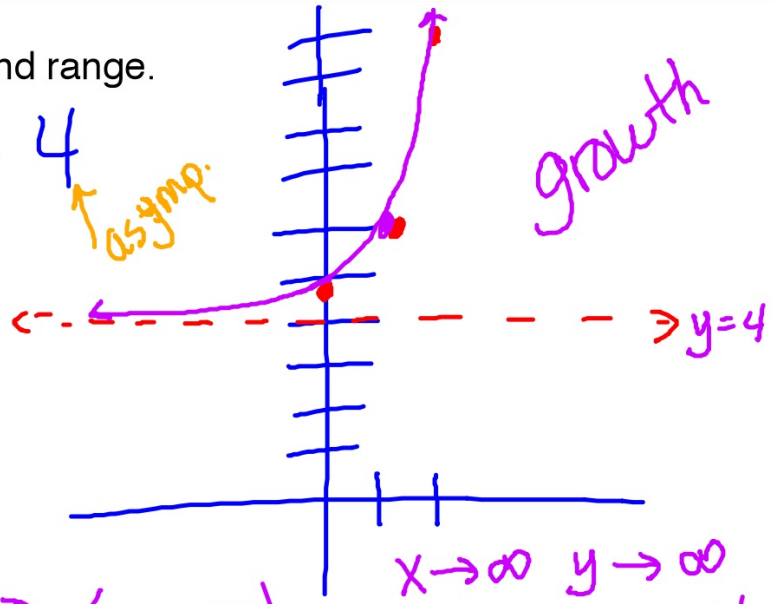
D: $(-\infty, \infty)$

R: $(0, \infty)$

Sketch. State domain and range.

$$y = 2 \cdot 3^{x-1} + 4$$

x	y
0	$2 \cdot \frac{1}{3} + 4 = 4\frac{2}{3}$
1	6
2	10
-3	$2 \cdot 3^{-4} + 4$
	$\frac{2}{81} + 4$
	$4\frac{2}{81}$



$x \to \infty \quad y \to \infty$

$x \to -\infty \quad y \to 4$

$D: (-\infty, \infty)$

$R: (4, \infty)$

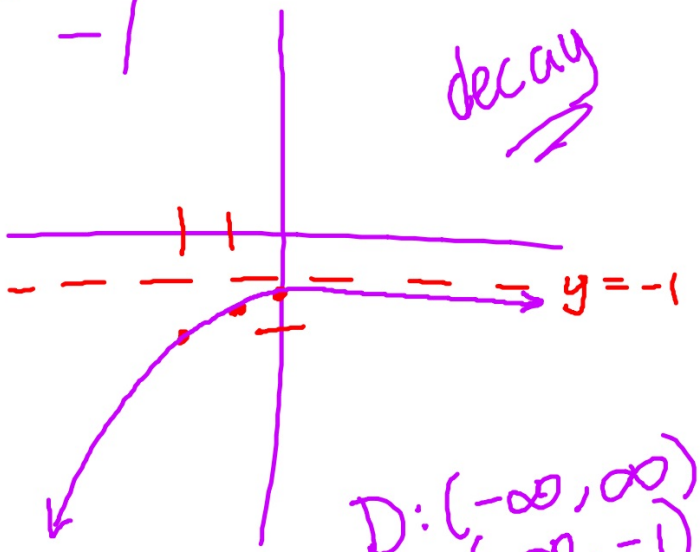
Sketch. Find the domain and range.

$y = -\left(\frac{1}{3}\right)^{x+2} - 1$

x	y
0	$-\frac{1}{9} - 1 = -1\frac{1}{9}$
-2	-2
-1	$-1\frac{1}{3}$

$0 < b < 1$
decay

$b > 1$
growth



D: $(-\infty, \infty)$
R: $(-\infty, -1)$