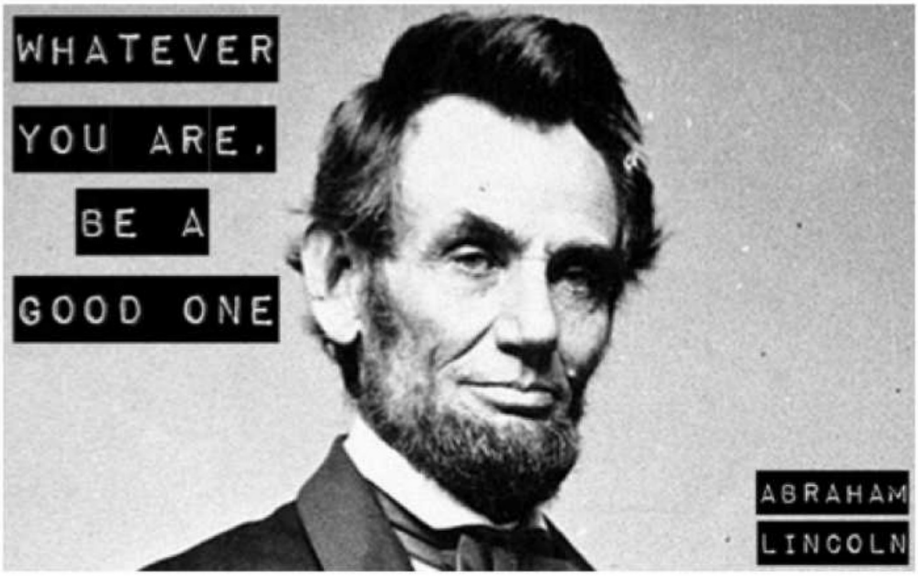
A2: Graphs of Exponential Functions



HW:

Exponential Functions

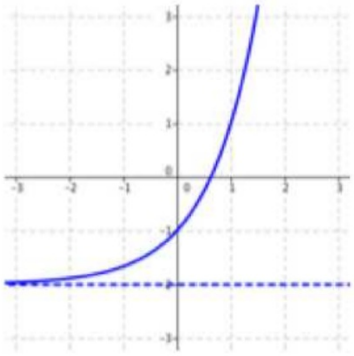
$$f(x) = ab^x$$

$$a \neq 0, \quad b > 0, \quad b \neq 1$$

b is called the growth or decay factor

Graphs of Exponential Functions

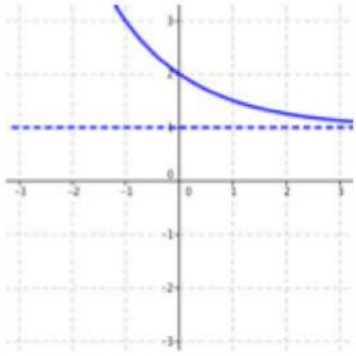
$$f(x) = ab^x$$



Exponential Growth

$b > 1$

*the RIGHT side of the graph moves AWAY from the asymptote



Exponential Decay

$0 < b < 1$

*the RIGHT side of the graph moves TOWARDS the asymptote

ex: Sketch. Then state the domain and range and classify as growth or decay.

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

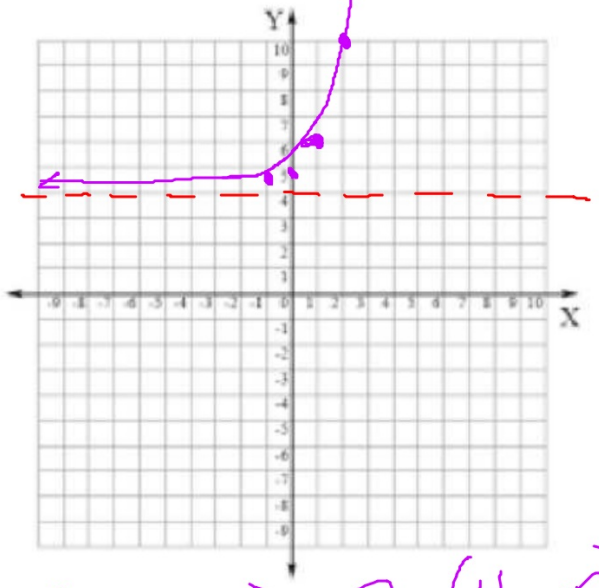
$x - 1 = 0$

$x = 1$

$3^{-1} = \frac{1}{3}$

HA

x	y
-1	$2 \cdot 3^{-2} + 4 = 4\frac{2}{9}$
0	$2 \cdot 3^{-1} + 4 = 4\frac{2}{3}$
1	$2 \cdot 3^{0} + 4 = 6$
2	$2 \cdot 3^{1} + 4 = 10$
3	



D: $(-\infty, \infty)$ R: $(4, \infty)$

ex: Sketch. Then state the domain and range and classify as growth or decay.

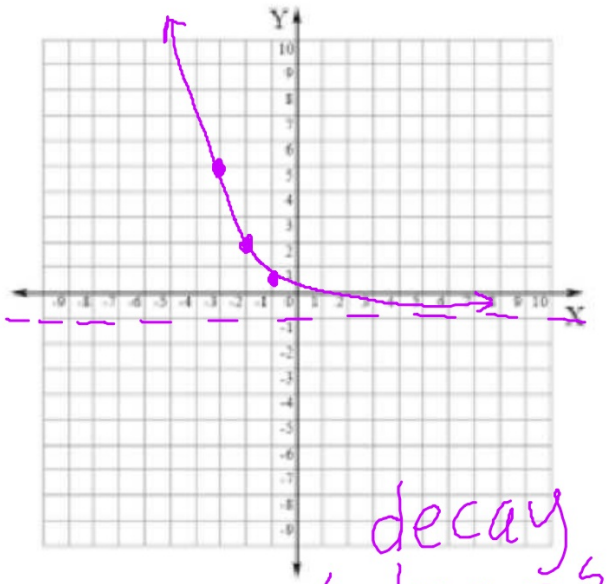
$x+2=0$

$x=-2$

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

$y=-1$ HA

x	y
-3	$3\left(\frac{1}{2}\right)^{-1}-1=5$
-2	$3\left(\frac{1}{2}\right)^{0}-1=2$
-1	$3\left(\frac{1}{2}\right)^{1}-1=\frac{3}{2}-1=\frac{1}{2}$



decay

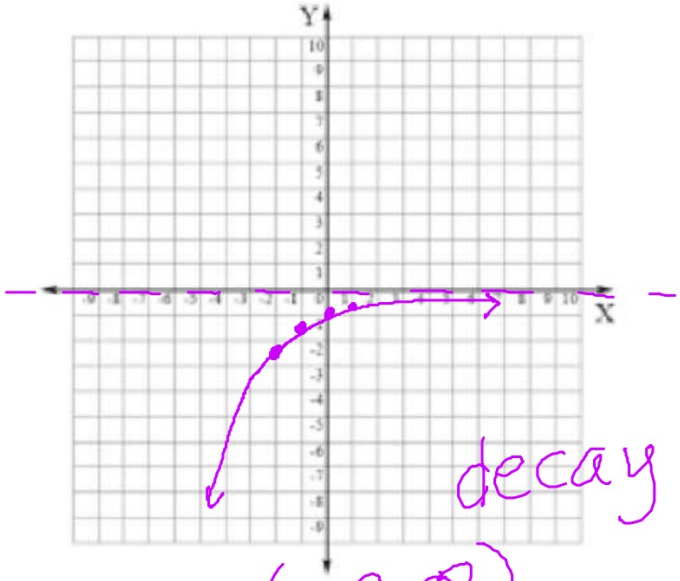
D: $\{x \mid x \in \mathbb{R}\}$

R: $\{y \mid y > -1\}$

ex: Sketch. Then state the domain and range and classify as growth or decay.

c) $y = -\left(\frac{2}{3}\right)^x + 0$ ← HA

x	y
−1	$-\left(\frac{2}{3}\right)^{-1} = -\frac{3}{2}$
0	$-\left(\frac{2}{3}\right)^{0} = -1$
1	$-\left(\frac{2}{3}\right)^{1} = -\frac{2}{3}$
−2	$-\left(\frac{2}{3}\right)^{-2} = -\frac{9}{4}$



decay

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

R: $(-\infty, 0)$

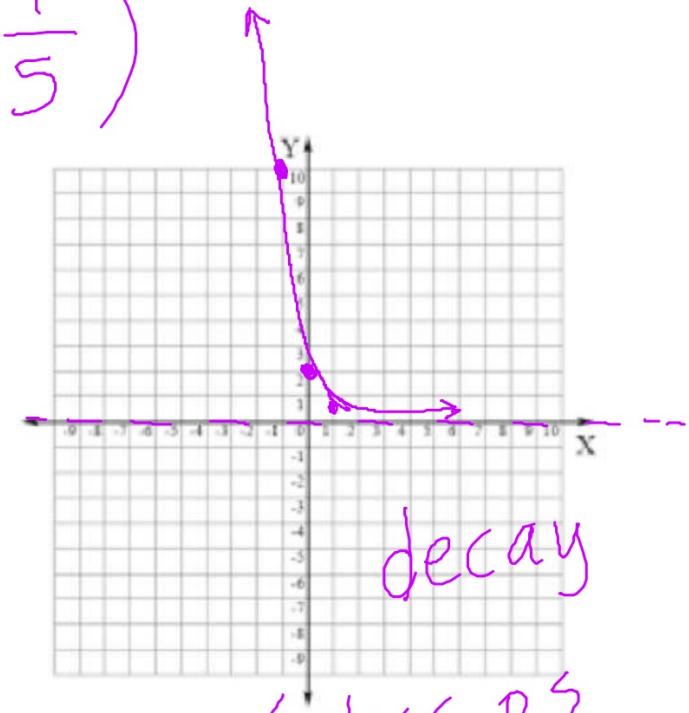
ex: Sketch. Then state the domain and range and classify as growth or decay.

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

d) $y = \cancel{2 \cdot 5^{4-x}}$

$y = 2 \cdot 5^{-x}$

x	y
-1	$2 \cdot 5^1 = 10$
0	$2 \cdot 5^0 = 2$
1	$2 \cdot 5^{-1} = 2 \cdot \frac{1}{5} = \frac{2}{5}$



decay

D: $\{x \mid x \in R\}$

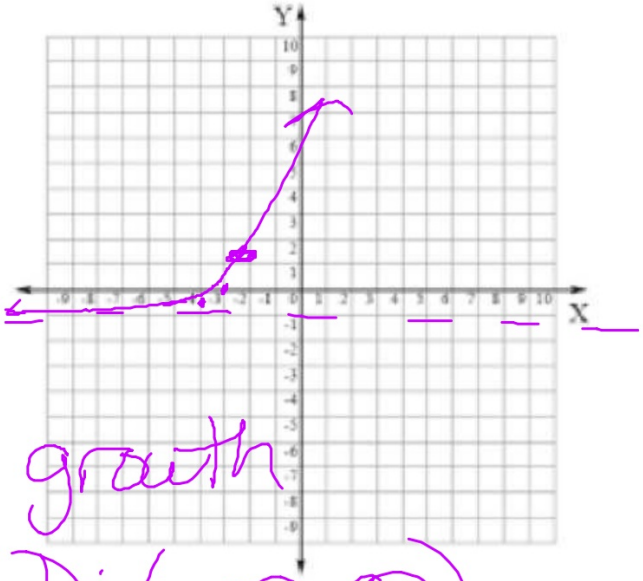
R: $\{y \mid y > 0\}$

ex: Sketch. Then state the domain and range and classify as growth or decay.

$e \approx 2.718$

e) $y = e^{x+3} - 1$

x	y
-4	-.63
-3	0
-2	1.72



growth

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

R: $(-1, \infty)$

ex: WITHOUT graphing determine if the function represents growth or decay, then state the growth or decay factor.

a) $y = \frac{1}{2} \cdot 3^{x-4} + 5$

growth

ex: WITHOUT graphing determine if the function represents growth or decay, then state the growth or decay factor.

b) $y = -\left(\frac{4}{5}\right)^{x+1}$

decay