$f(x) = 3^{x-2}$

$= 3^x \cdot 3^{-2}$

$= \left(\frac{1}{9}\right) \cdot 3^x$

$g(x) = 3^x - 9$

$= 3^x - 3^2$

$h(x) = \frac{1}{9}(3^x)$

$\therefore f(x) = h(x)$

$x^2 \cdot x^3 = x^5$

$x^3 \cdot x^a = x^{3+a}$

$f(x) = 16(4^{-x})$

$4^2 \cdot 4^{-x}$

$4^2 \cdot \frac{1}{4}^x$

$16 \cdot \frac{1}{4}^x$

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

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

$= (\frac{1}{4})^x \cdot 16$

$= 16(\frac{1}{4})^x$

$h(x) = 16(2^{-2x})$

$4^2 \cdot 2^{-2x}$

$4^2 \cdot \frac{1}{4}^x$

$16 \cdot \frac{1}{4}^x$

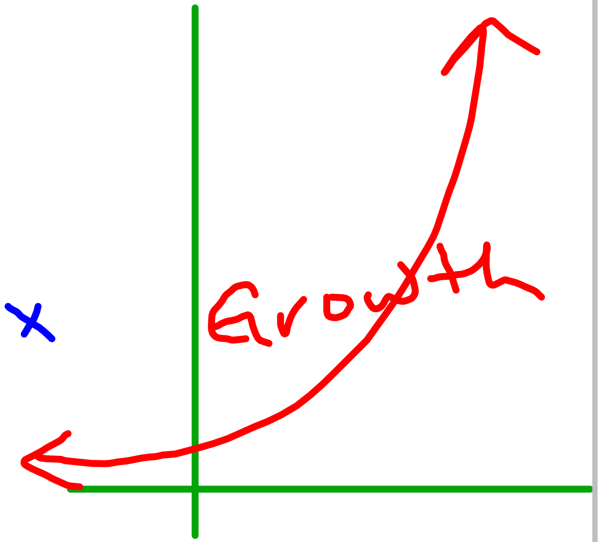
$f(x) = h(x) = g(x)$

Growth & Decay Revisited

Growth: 1. $a > 1$; positive x

2. $0 < a < 1$; negative x

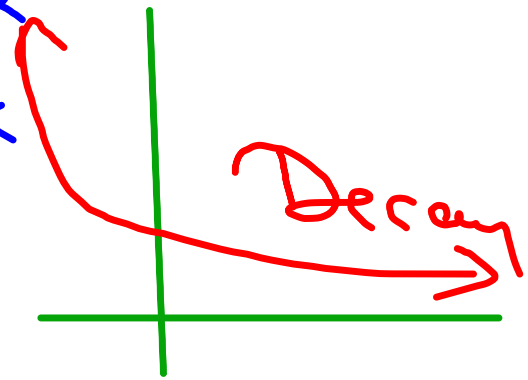
Ex: $y = \left(\frac{3}{5}\right)^{-2x}$



Decay 1. $0 < a < 1$; positive x

2. $a > 1$; negative x

$y = \left(\frac{7}{6}\right)^{-x}$



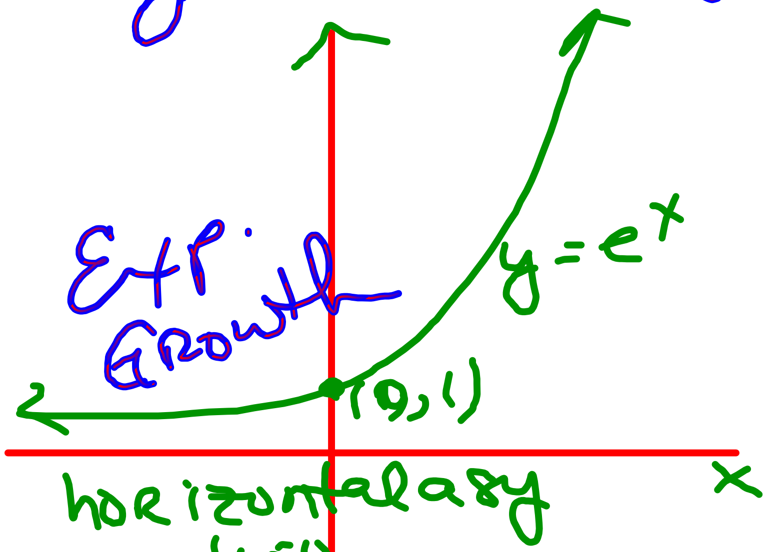
Natural Exponential Function

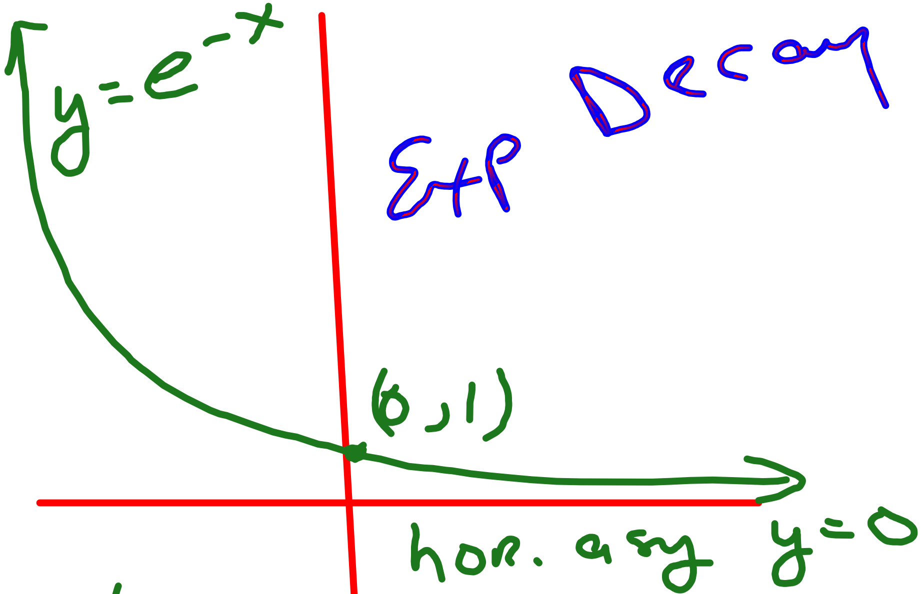
$$\lim_{x \to \infty} \left(1 + \frac{1}{x}\right)^x = e$$

x	1	10	10^2	10^3	10^4	10^5	10^7	10^9	10^{11}
y	2	2.594	2.7051	2.7169	2.718	2.718	2.71833	2.718	2.718

$y = e^x$ growth (positive exp)

$y = e^{-x}$ decay (negative exp)





$$\lim_{x \to -\infty} e^x = e^{-\infty} = \frac{1}{e^{\infty}} = \frac{1}{\infty} = 0$$

$\therefore$ $y = 0$ is H.A.

$$\lim_{x \to \infty} e^{-x} = e^{-\infty} = \frac{1}{e^{\infty}} = \frac{1}{\infty} = 0$$

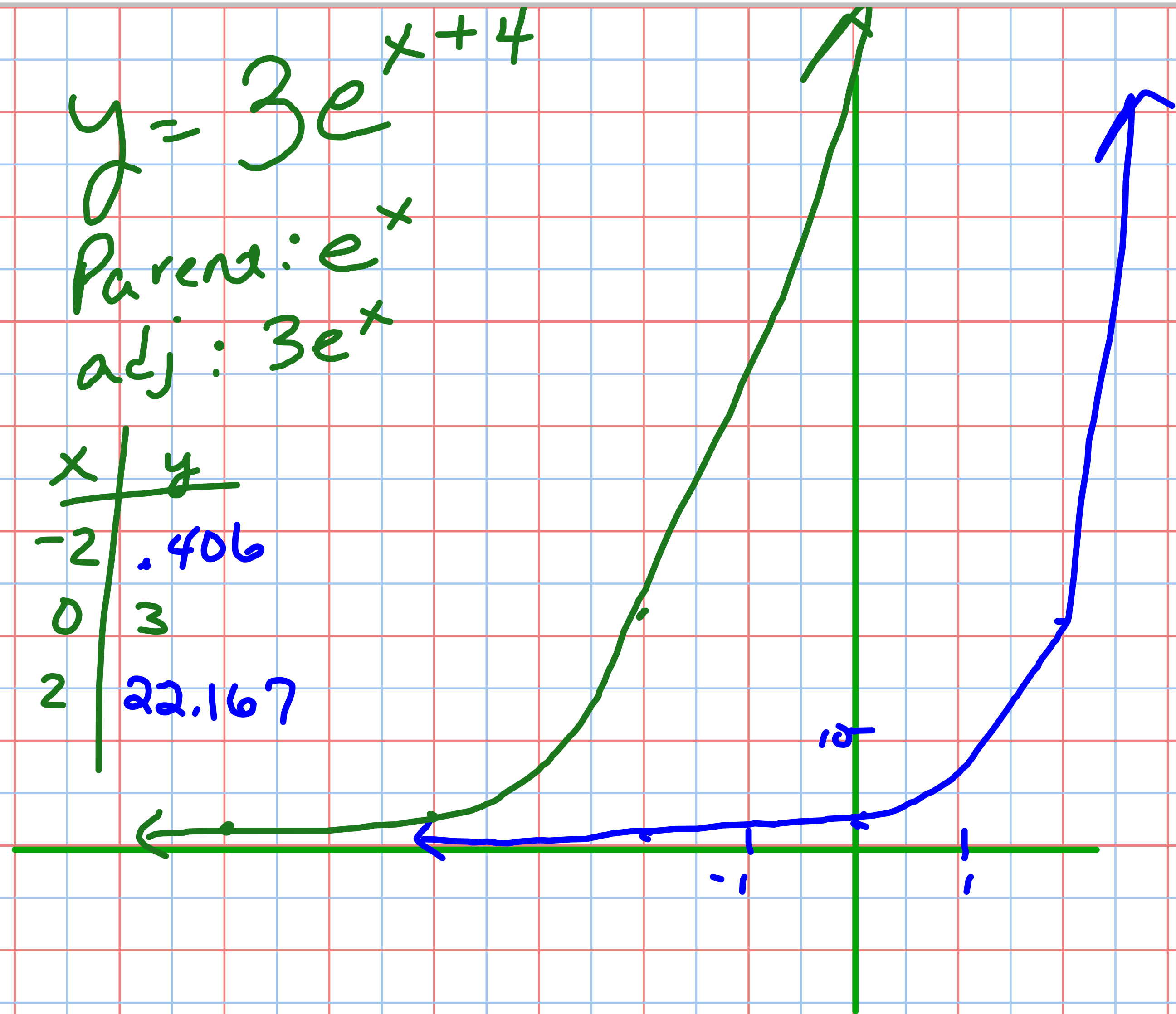
$\therefore$ $y = 0$ is hor asy

$y = 3e^{x+4}$

Parent: e^x

adj: $3e^x$

x	y
-2	.406
0	3
2	22.167



Transf.

$x+4=0$

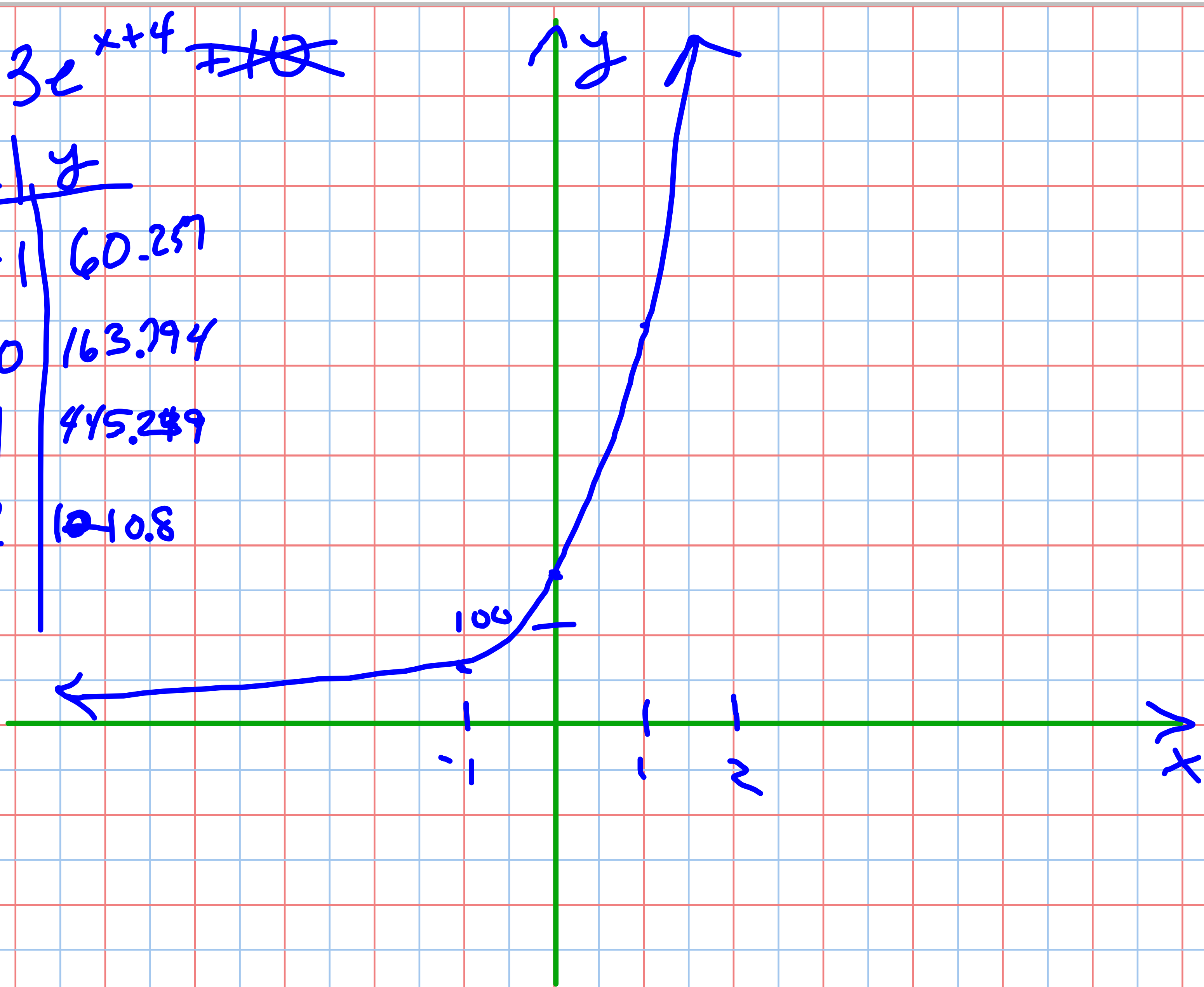
$x=-4$

means

left 4

$y = 3e^{x+4} \cancel{+10}$

x	y
-1	60.257
0	163.794
1	445.289
2	1210.8



Find any asymptotes for the graph

$$g(x) = \frac{8}{1 + e^{-.5/x}}$$

$$\lim_{x \to \infty} \frac{8}{1 + e^{-.5/\infty}} = \frac{8}{1 + e^{0}} = \frac{8}{1+1} = 4$$

$\therefore$ $y = 4$ is a hor asy

$$\infty + 1 = \infty$$

$$\frac{8}{\infty} = 0$$