3.1 EXPONENTIAL FUNCTIONS

What is an exponential function?

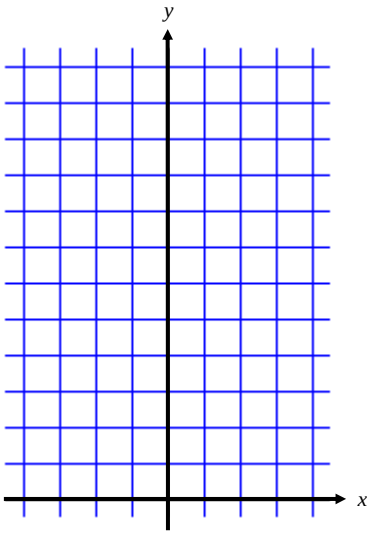
An exponential function $f(x)$ is given by _____, where a is any number greater than 0 except 1.

If $0 < a < 1$, then we say that $f(x)$ represents exponential _____.

If $a > 1$, then we say that $f(x)$ represents exponential _____.

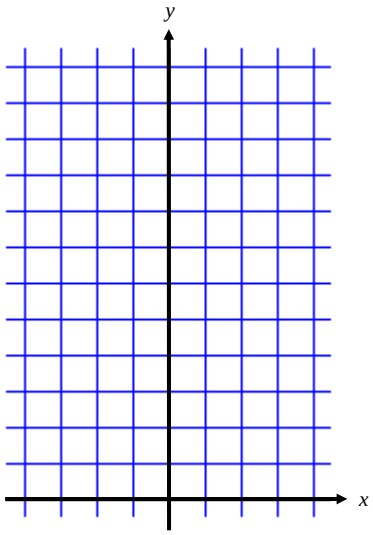
Example: Complete the table below, then graph $g(x) = 3^x$.

x	y
–2	
–1	
0	
1	
2	



Example: Complete the table below, then graph $g(x) = \left(\frac{1}{3}\right)^x$.

x	y
–2	
–1	
0	
1	
2	



The number e

The number e, like π, is an irrational number that shows up enough in a variety of contexts to have it's own symbol.

The number e is defined by $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x \approx 2.718281828459$.

The since $e > 1$, the graph of $y = e^x$ is similar to the first example above.

Taking the Derivative of e^x.

If $f(x) = e^x$, then $f'(x)$ = _____.

Using the chain rule, if u is a differentiable function of x, then $\frac{d}{dx}\left[e^u\right] =$ _____.

Example: Find the derivative of each function.

a) $h(x) = \frac{1}{3}e^{-4x}$

b) $f(x) = x^7 e^{4x}$

c) $g(x) = \sqrt{e^x + 1}$

d) $f(x) = \dfrac{e^x}{1 - e^x}$