The Natural Exponential Function **Name:** _____

Definition 1. *The number e is defined as the value that* $A(n) = \left(1 + \frac{1}{n}\right)^n$ *approaches as n becomes large. This number is approximately 2.71.*

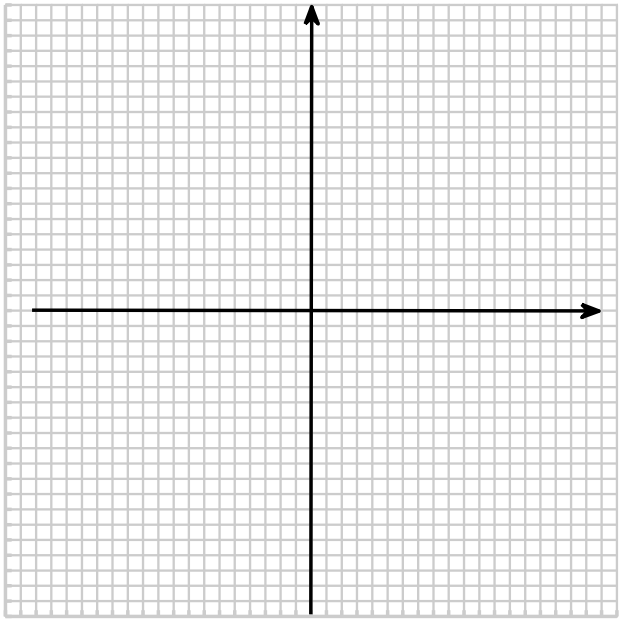
n	$A(n) = \left(1 + \frac{1}{n}\right)^n$
1	2.00
2	2.25
3	2.370370
4	2.441406
5	2.488320
100	2.704814
365	2.714567

Definition 2. *The natural exponential function is the exponential function*

$$f(x) = e^x$$

with base e.

Graph
$f(x) = e^x$**.**



1. What interval represents the domain of $f(x)$? 1. _____

2. What equation represents the vertical asymptote for $f(x)$? 2. _____

3. What interval represents the range of $f(x)$? 3. _____

Properties of Natural Logarithms

Property	Reason
1. $\ln 1 = 0$	We must raise e to the power 0 to get 1.
2. $\ln e = 1$	We must raise e to the power 1 to get e.
3. $\ln e^x = x$	We must raise e to the power x to get e^x.
4. $e^{\ln x} = x$	$\ln x$ is the power to which e must be raised to get x.

Evaluate Each Expression.

4. $\ln e^{-3}$ 4. _____

5. $\ln\left(\frac{1}{e^4}\right)$ 5. _____

6. $\ln 5$ 6. _____

Definition 3. *The logarithm with base e is called the* ***natural logarithm*** *and is denoted by* ***ln****:*

$$\ln(x) = \log_e(x)$$

Find the domain of each function.

7. $f(x) = \log_2(4 - x^2)$ 7. _____

8. $f(x) = \ln(x + 2)$ 8. _____

9. $f(x) = \log_7(1 - 2x) + 4$ 9. _____