

Warm-up: put at top of today's assignment

Write the first 8 terms of the given pattern:

$$1 + \frac{1}{1} + \frac{1}{1 \cdot 2} + \frac{1}{1 \cdot 2 \cdot 3} + \dots + \frac{1}{\dots}$$

$a_1$   $a_2$   $a_3$   $a_4$

Fill in the actual values  
on your hw paper!!!

## Warm-up

(put at top of today's assignment)

$$1 + \frac{1}{1} + \frac{1}{1 \cdot 2} + \frac{1}{1 \cdot 2 \cdot 3} + \dots + \frac{1}{\dots}$$

Fill in the actual values  
on your hw paper!!!

Now simplify using fractions:

$$1 + 1 + \frac{1}{2} + \frac{1}{6} + \frac{1}{\dots} + \frac{1}{\dots} + \frac{1}{\dots} + \frac{1}{\dots} \approx \boxed{\dots}$$

Round off to the  
nearest millionth !

The answer for the first 8 terms:

*2.718254*

*e = 2.7182818284590452353603*

*e*

*e*

*e*

*e*

*e*

$y = \log x \rightarrow$  common logarithm (base 10)

$y = \ln x \rightarrow$  natural logarithm (base e)

**common  
logarithm**

**natural  
logarithm**



e is often called **Euler's number** after Leonhard Euler, a famous Swiss mathematician from the 1700's

**Summation notation** →  $e = \sum_{n=0}^{\infty} \frac{1}{n!} = 1 + \frac{1}{1} + \frac{1}{1 \cdot 2} + \frac{1}{1 \cdot 2 \cdot 3} + \dots$

**Calculus notation** →  $e = \lim_{n \rightarrow \infty} \left( 1 + \frac{1}{n} \right)^n$





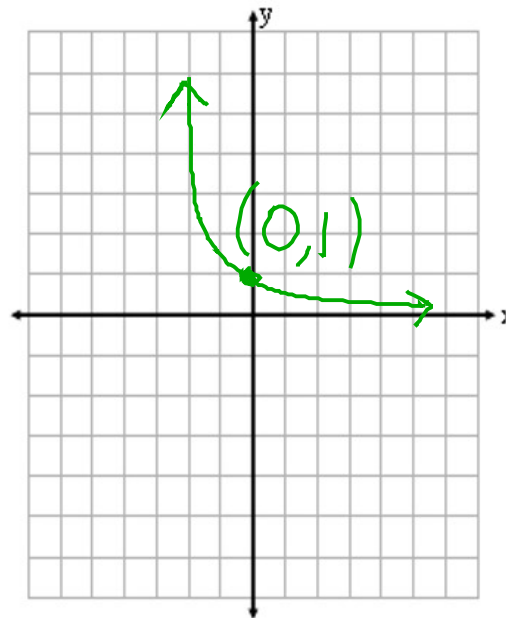
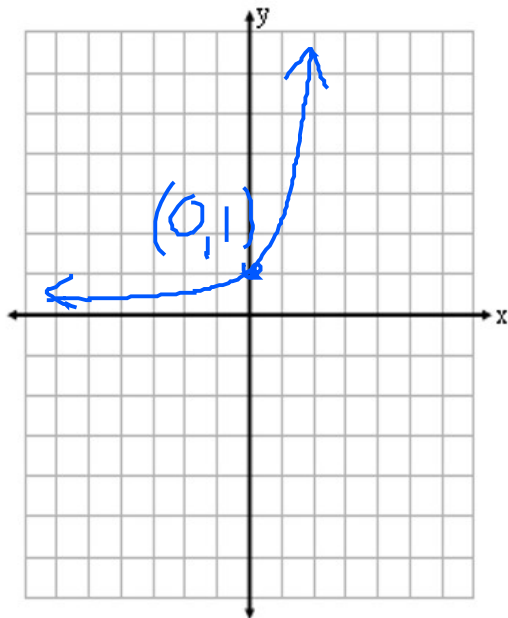
2.7182818284590452353602874713526624  
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342952605956307381323286279434907632  
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3. 141592653589793238462643383279502884197169399375105820974944592  
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95505822317253594081284811174502841027019385211055596446229489549  
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74818467669405132... 0568127... 526356082... 5771342757789609173637178  
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## 4.2 Notes: The Natural Exponential Function

Sketch a graph of

$$y = e^x \quad \text{and} \quad y = e^{-x}$$



NOTES:

Domain  $\rightarrow (-\infty, \infty)$

Range  $\rightarrow (0, \infty)$

Asymptote at  $y=0$



## 4-2 notes:

### Continuously Compounded Interest

$$A = Pe^{rt}$$

**A = final amount**

**P = principal (initial investment)**

**r = interest rate**

**t = # of years**

## 4-2 notes:

Compounded:

Annually →  $n = 1$

Semi-annually →  $n = 2$

Quarterly →  $n = 4$

Monthly →  $n = 12$

Daily →  $n = 365$

### Compound Interest

$$A = P \left( 1 + \frac{r}{n} \right)^{nt}$$

$\sim 5\% = .05$

change % to  
a decimal

**A = final amount**

**P = principal (initial investment)**

**r = annual (yearly) interest rate**

**n = # times interest is paid per year  
(compounded)**

**t = # of years**

## Special Instructions for 4.2 #37a-c

compare interest rate options by assuming a \$10,000 investment earning interest for 5 years.

### Compound Interest

$$A = P \left( 1 + \frac{r}{n} \right)^{nt}$$

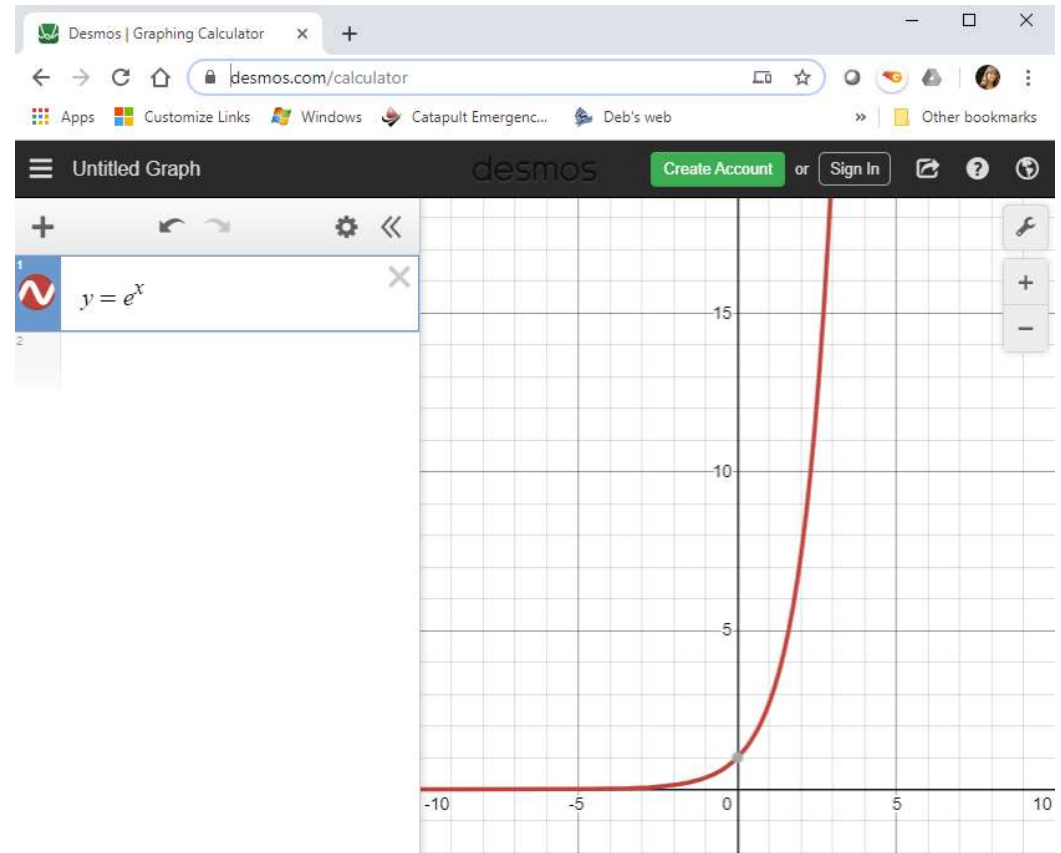
**versus**

### Continuously Compounded Interest

$$A = Pe^{rt}$$

## 4.2 #25c and 29b

use a graphing calculator or Desmos to help with your sketch



<https://www.desmos.com/calculator>