3.1b The Natural Base e

The number e (Thanks Euler!) is a mathematical constant approximately equal to the number 2.71828... and is also the base of a natural logarithm. Super handy with compound interest and population growth and more!

Definition

The natural exponential function f with base e is denoted by:

$f(x) = e^x$ and x is any real #

Ex 1: Evaluate each using your calculator:

a. $g(x) = e^x$ if $x = -2$ ________

b. $b(x) = e^{-x}$ if $x = 0.25$ ________

c. $h(x) = e^x$ if $x = \frac{1}{2}$ ________

d. $s(x) = e^{2x}$ if $x = 12$ ________

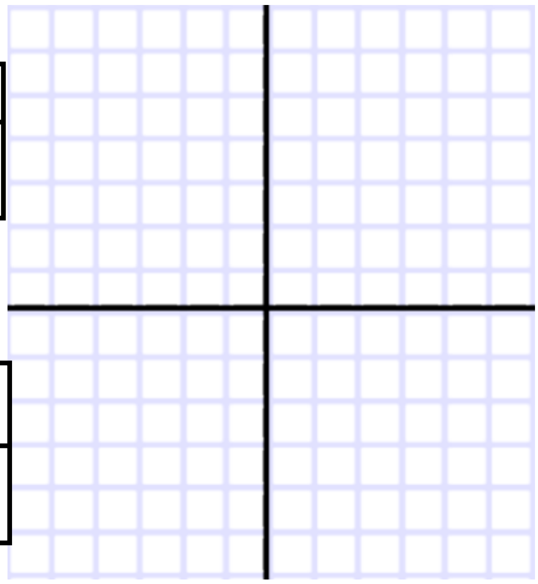
Ex 2: Fill in the chart for each function, then graph the results.

a. $f(x) = 2e^{0.24x}$

x	-3	-2	-1	0	1	2	3
f(x)							

b. $g(x) = \frac{1}{2}e^{-0.58x}$

x	-3	-2	-1	0	1	2	3
g(x)							



Formulas for Compound Interest

After t years, the balance A in an account with principal P and annual interest rate r (in decimal form) is given by the following formulas:

1. For n compoundings per year: $A = P(1 + \frac{r}{t})^{nt}$
2. For continuous compounding: $A = Pe^{rt}$

Ex 3: A total of $12,000 is invested at an annual interest rate of 3%. Find the balance after 4 years when interest is compounded

(a) quarterly	(b) continuously

Ex 4: The approximate number of fruit flies in an experimental population after t hours is given by $Q(t) = 20e^{0.003t}$, where $t \geq 0$.

a. Find the initial number of fruit flies in the population.

b. How large is the population of fruit flies after 72 hours?

c. Graph Q