Common and Natural Logarithms

Common Logarithms

- A common logarithm has a base of 10.
- If there is no base given explicitly, it is common.
- You can easily find common logs of powers of ten.
- You can use your calculator to evaluate common logs.

Natural Logarithms

- A natural logarithm has a base of *e*.

- The mathematical constant ***e*** is the unique real number such that the derivative (the slope of the tangent line) of the function $f(x) = e^x$ is $f'(x) = e^x$, and its value at the point $x = 0$, is exactly 1.
- The function e^x so defined is called the exponential function.
- The inverse of the exponential function is the natural logarithm, or logarithm with base e.
- The number *e* is also commonly *defined* as the base of the natural logarithm (using an integral to define the latter), as the limit of a certain sequence, or as the sum of a certain series.
- The number *e* is one of the most important numbers in mathematics, alongside the additive and multiplicative identities 0 and 1, the constant π, and the imaginary number *i*.
- *e* is irrational, and as such its value cannot be given exactly as a finite or eventually repeating decimal. The numerical value of *e* truncated to 20 decimal places is:
  - 2.71828 18284 59045 23536..

Natural Logarithms

- A natural logarithm has a base of *e*.
- We write natural logarithms as ln.
  - In other words, $\log_e x = \ln x$.
- If ln e = x…

Change of Base Formula

- Allows us to convert to a different base.
- If a, b, and n are positive numbers and neither a nor b is 1, then the following equation is true.

$$\log_a n = \frac{\log_b n}{\log_b a}$$

- Examples of evaluating expressions
- Change of base formula examples