Formulas and Theorems

The Number e as a limit

i). $$\lim_{n \to +\infty} \left(1 + \frac{1}{n}\right)^n = e$$

ii). $$\lim_{n \to 0} \left(1 + \frac{n}{1}\right)^{\frac{1}{n}} = e$$

Properties of $y = e^x$

1. The exponential function $y = e^x$ is the inverse function of $y = \ln x$.
2. The domain is the set of all real numbers, $-\infty < x < \infty$.
3. The range is the set of all positive numbers, $y > 0$.
4. $\dfrac{d}{dx}(e^x) = e^x$ and $\dfrac{d}{dx}\left(e^{f(x)}\right) = f'(x)e^{f(x)}$
5. $e^{x_1} \cdot e^{x_2} = e^{x_1 + x_2}$
6. $y = e^x$ is continuous, increasing, and concave up for all x.
7. $\lim\limits_{x \to \infty} e^x = +\infty$ and $\lim\limits_{x \to -\infty} e^x = 0$.
8. $e^{\ln x} = x$, for $x > 0$; $\ln(e^x) = x$ for all x.