General - Notes

Dom Hutchinson

February 21, 2018

1 Trig Identities

$$
\begin{aligned}
sin(\alpha+\beta) &= sin(\alpha)cos(\beta)+sin(\beta)cos(\alpha)\\
sin(\alpha-\beta) &= sin(\alpha)cos(\beta)-sin(\beta)cos(\alpha)\\
cos(\alpha+\beta) &= cos(\alpha)cos(\beta)-sin(\alpha)sin(\beta)\\
cos(\alpha-\beta) &= cos(\alpha)cos(\beta)+sin(\alpha)sin(\beta)\\
sin^2(x)+cos^2(x) &= 1\\
tan^2(x)+1 &= sec^2(x)\\
1+cot^2(x) &= cosec^2(x)\\
sin(2x) &= 2.sin(x).cos(x)\\
cos(2x) &= cos^2(x)-sin^2(x)\\
&= 2cos^2(x)-1\\
&= 1-2sin^2(x)\\
sin^2(x) &= \frac{1-cos(2x)}{2}\\
cos^2(x) &= \frac{1+cos(2x)}{2}\\
tan^2(x) &= \frac{1-cos(2x)}{1+cos(2x)}\\
sin(x)+sin(y) &= 2.sin\left(\frac{x+y}{2}\right).cos\left(\frac{x-y}{2}\right)\\
sin(x)-sin(y) &= 2.sin\left(\frac{x-y}{2}\right).cos\left(\frac{x+y}{2}\right)\\
cos(x)+cos(y) &= 2.cos\left(\frac{x+y}{2}\right).cos\left(\frac{x-y}{2}\right)\\
cos(x)-cos(y) &= -2.sin\left(\frac{x+y}{2}\right).sin\left(\frac{x-y}{2}\right)
\end{aligned}
$$

2 Limits

$$
\begin{aligned}
\lim_{x\to x_0}\frac{1-x}{1+x} &= 1\\
\lim_{x\to\infty}\frac{1}{x} &= 0\\
\lim_{x\to 0}\frac{sin(x)}{x} &= 1
\end{aligned}
$$

3 Differentiation

3.1 Techniques

Sum Rule

$$(f+g)' = f' + g'$$

Product Rule

$$(fg)' = f'g + fg'$$

Quotient Rule

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$$

Chain Rule

$$\frac{d}{dx}f(g(x)) = f'(g(x)).g'(x)$$

3.2 Common Results

$$\begin{aligned}
\frac{d}{dx}(x^n) &= nx^{n-1} \\
\frac{d}{dx}(e^x) &= e^x \\
\frac{d}{dx}(ln(x)) &= \frac{1}{x} \\
\frac{d}{dx}(sin(x)) &= cos(x) \\
\frac{d}{dx}(cos(x)) &= -sin(x) \\
\frac{d}{dx}(tan(x)) &= sec^2(x) \\
\frac{d}{dx}(cot(x)) &= -cosec^2(x) \\
\frac{d}{dx}(sec(x)) &= tan(x).sec(x) \\
\frac{d}{dx}(cosec(x)) &= -cosec(x).cot(x)
\end{aligned}$$