Topic 6—Calculus

6.1	Derivative of $f(x)$	$y = f(x) \Rightarrow \frac{\mathrm{d}y}{\mathrm{d}x} = f'(x) = \lim_{h \to 0}\left(\frac{f(x+h) - f(x)}{h}\right)$
6.2	Derivative of x^n	$f(x) = x^n \Rightarrow f'(x) = nx^{n-1}$
	Derivative of $\sin x$	$f(x) = \sin x \Rightarrow f'(x) = \cos x$
	Derivative of $\cos x$	$f(x) = \cos x \Rightarrow f'(x) = -\sin x$
	Derivative of $\tan x$	$f(x) = \tan x \Rightarrow f'(x) = \frac{1}{\cos^2 x}$
	Derivative of e^x	$f(x) = \mathrm{e}^x \Rightarrow f'(x) = \mathrm{e}^x$
	Derivative of $\ln x$	$f(x) = \ln x \Rightarrow f'(x) = \frac{1}{x}$
	Chain rule	$y = g(u),\ u = f(x) \Rightarrow \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{\mathrm{d}y}{\mathrm{d}u} \times \frac{\mathrm{d}u}{\mathrm{d}x}$
	Product rule	$y = uv \Rightarrow \frac{\mathrm{d}y}{\mathrm{d}x} = u\frac{\mathrm{d}v}{\mathrm{d}x} + v\frac{\mathrm{d}u}{\mathrm{d}x}$
	Quotient rule	$y = \frac{u}{v} \Rightarrow \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{v\frac{\mathrm{d}u}{\mathrm{d}x} - u\frac{\mathrm{d}v}{\mathrm{d}x}}{v^2}$
6.4	Standard integrals	$\int x^n \,\mathrm{d}x = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$
		$\int \frac{1}{x} \,\mathrm{d}x = \ln x + C,\ x > 0$
		$\int \sin x \,\mathrm{d}x = -\cos x + C$
		$\int \cos x \,\mathrm{d}x = \sin x + C$
		$\int \mathrm{e}^x \,\mathrm{d}x = \mathrm{e}^x + C$
6.5	Area under a curve between $x = a$ and $x = b$	$A = \int_a^b y \,\mathrm{d}x$
	Volume of revolution about the x-axis from $x = a$ to $x = b$	$V = \int_a^b \pi y^2 \,\mathrm{d}x$
6.6	Total distance travelled from t_1 to t_2	$\text{distance} = \int_{t_1}^{t_2} \lvert v(t) \rvert \,\mathrm{d}t$