IBDP Mathematics (SL)
Formula sheet

Prior learning

Area of a parallelogram	$A = bh$ b = base, h = height
Area of a triangle	$A = \frac{1}{2}bh$
Area of a trapezium	$A = \frac{1}{2}\,(\mathrm{a}+\mathrm{b})h$ a, b = parallel sides, h = height
Area of a circle	$A = \pi r^2, r\ is\ radius$
Circumference of a circle	$C = 2\pi r, r\ is\ radius$
Volume of a cuboid	$V = lwh$
Volume of a pyramid or cone	$V = \frac{1}{3}$ x base area x vertical height
Volume a cylinder	$V = \pi r^2 h$
Volume of a sphere	$V = \frac{4}{3}\pi r^3$
Curved surface area of a cylinder	$A = 2\pi rh$
Two points distance	$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$
Midpoint	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)$

Topic 2 Functions

Axis of symmetry	$f(x) = ax^2 + bx + c \ \rightarrow\ x = \frac{-b}{2a}$
Exponents and logarithms	$a^x = e^{x\ln a}\ ;\ log_a a^x = x = a^{log_a x}$
Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, a \neq 0$
Discriminant	$\Delta = b^2 - 4ac$

Topic 4 Vectors

Magnitude of a vector	$\lvert v \rvert = \sqrt{{v_1}^2 + {v_2}^2 + {v_3}^2}$
Scalar product	$v \cdot w = \lvert v \rvert \lvert w \rvert \cos\theta$ $v \cdot w = v_1 w_1 + v_2 w_2 + v_3 w_3$
Angle between two vectors	$\cos\theta = \frac{v \cdot w}{\lvert v \rvert \lvert w \rvert}$
Vector equation of a line	$\boldsymbol{r} = \boldsymbol{a} + t\boldsymbol{b}$

Topic 1 Algebra

The nth term of A.S.	$u_n = u_1 + (n-1)d$
The sum of n terms of A.S.	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$
The nth terms of G.S.	$u_n = u_1 r^{n-1}$
The sum of n terms of G.S.	$S_n = \frac{u_1(r^n - 1)}{r - 1} = \frac{u_1(1 - r^n)}{1 - r}, r \neq 1$
The sum of an infinite G.S.	$S_\infty = \frac{u_1}{1 - r}, \lvert r \rvert < 1$
Exponents and logarithms	$a^x = b \ \leftrightarrow\ x = log_a b$
Logarithms	$log_c a + log_c b = log_c ab$ $log_c a - log_c b = log_c \frac{a}{b}$ $log_c a^r = r\,log_c a$ $log_b a = \frac{log_c a}{log_c b}$
Binomial coefficient	$\binom{n}{r} = \frac{n!}{r!(n-r)!}$
Binomial theorem	$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{r}a^{n-r}b^r + \cdots + b^n$

Topic 3 Geometry and trigonometry

Arc length	$l = r\theta$, where θ is in radians
Sector area	$A = \frac{1}{2}r^2\theta$, where θ is in radians
Cosine rule	$c^2 = a^2 + b^2 - 2ab\cos C$ $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$
Sine rule	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Area of a triangle	$A = \frac{1}{2}ab\sin C$
Identity for tan $\boldsymbol{\theta}$	$\tan\theta = \frac{\sin\theta}{\cos\theta}$
Pythagorean identity	$cos^2\theta + sin^2\theta = 1$
Double angle identities	$\sin 2\theta = 2\sin\theta\cos\theta$ $\cos 2\theta = cos^2\theta - sin^2\theta$ $= 2\,cos^2\theta - 1 = 1 - 2\,sin^2\theta$

Topic 5 Statistics and probability		Topic 6 Calculus	
Mean of a set of data	$\bar{x} = \frac{\sum_{i=1}^{k} f_i x_i}{n}, where\ n \sum_{i=1}^{k} f_i$	**Derivative of $f(x)$**	$y = f(x) \rightarrow \frac{dy}{dx} = f'(x) = \lim_{h \to 0}\left(\frac{f(x+h) - f(x)}{h}\right)$
Probability of an event *A*	$P(A) = \frac{n(A)}{n(U)}$	**Derivative of x^n**	$f(x) = x^n \rightarrow f'(x) = nx^{n-1}$
Complementary events	$P(A) + P(A') = 1$	**Derivative of $\sin x$**	$f(x) = \sin x \rightarrow f'(x) = \cos x$
Combined events	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	**Derivative of $\cos x$**	$f(x) = \cos x \rightarrow f'(x) = -\sin x$
Mutually exclusive events	$P(A \cup B) = P(A) + P(B)$	**Derivative of $\tan x$**	$f(x) = \tan x \rightarrow f'(x) = \frac{1}{cos^2 x}$
Conditional probability	$P(A\|B) = \frac{P(A \cap B)}{P(B)}$	**Derivative of e^x**	$f(x) = e^x \rightarrow f'(x) = e^x$
Independent events	$P(A \cup B) = P(A)P(B)$	**Derivative of $\ln x$**	$f(x) = \ln x \rightarrow f'(x) = \frac{1}{x}$
Expected value of a discrete random variable *X*	$E(X) = \mu = \sum x\mathrm{P}(X = x)$	**Chain rule**	$y = \left(f(x)\right)^n \rightarrow \frac{dy}{dx} = n(f(x))^{n-1}\ x\ f'(x)$
Standardized normal variable	$z = \frac{x - \mu}{\sigma}$	**Product rule**	$y = uv \rightarrow \frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$
Binomial distribution **Mean** **Variance**	$X \sim B(n,p)$ $\rightarrow P(X = r) = \binom{n}{r} p^r (1-p)^{n-r}$ $E(X) = np$ $Var(X) = np(1-p)$	**Quotient rule**	$y = \frac{u}{v} \rightarrow \frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$
		Standard integrals	$\int x^n dx = \frac{x^{n+1}}{n+1} + C\ , n \neq 1$ $\int \frac{1}{x} dx = \|x\| + C$ $\int \sin x\, dx = -\cos x + C$ $\int \cos x\, dx = \sin x + C$ $\int e^x dx = e^x + C$
		Area under a curve between $x = a$ and $x = b$	$A = \int_a^b y\, dx$
		Volume of revolution about the x-axis from $x = a$ and $x = b$	$V = \int_a^b \pi y^2\, dx$
		Total distance travelled from t_1 to t_2	$Distance = \int_{t_1}^{t_2} \|v(t)\|\, dt$