Mathematics Methods Units 1 and 2 Formula Sheet

Measurement

Circumference of circle, radius r
$C = 2\pi r$

Arc length of circle, central angle θ
$l = r\theta$

Area of circle
$A = \pi r^2$

Area of sector
$A = \frac{1}{2} r^2 \theta$

Area of segment
$A = \frac{1}{2} r^2 (\theta - \sin\theta)$

Trigonometry

$\sin(-\theta) = -\sin\theta$
$\cos(-\theta) = \cos\theta$
$\tan(-\theta) = -\tan\theta$

$\sin(\theta + \frac{\pi}{2}) = \cos\theta$
$\cos(\theta - \frac{\pi}{2}) = \sin\theta$

$\sin^2\theta + \cos^2\theta = 1$

$\sin(\theta \pm \phi) = \sin\theta\cos\phi \pm \cos\theta\sin\phi$

$\cos(\theta \pm \phi) = \cos\theta\cos\phi \mp \sin\theta\sin\phi$

$\tan(\theta \pm \phi) = \dfrac{\tan\theta \pm \tan\phi}{1 \mp \tan\theta\tan\phi}$

In any triangle ABC

Sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine rule

$a^2 = b^2 + c^2 - 2bc\cos A$

Area

$A = \frac{1}{2} ab \sin C$

$A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \dfrac{a+b+c}{2}$

Function

If $ax^2 + bx + c = 0$ then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Probability

$P(\overline{A}) = 1 - P(A)$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cap B) = P(A)\,P(B \mid A) = P(B)\,P(A \mid B)$

Sequences and series

Arithmetic

$a + (a+d) + (a+2d) + (a+3d) + \ldots$

$T_{n+1} = T_n + d,\ T_1 = a$

$T_n = a + (n-1)d$

$S_n = \frac{n}{2}\left(2a + (n-1)d\right)$

Geometric

$a + ar + ar^2 + ar^3 + \ldots$

$T_{n+1} = rT_n,\ T_1 = a$

$T_n = ar^{n-1}$

$S_n = \dfrac{a(1-r^n)}{1-r}$

$S_\infty = \dfrac{a}{1-r},\ |r| < 1$

Differential calculus

If $f(x) = y$ then $f'(x) = \dfrac{dy}{dx}$

$f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$

If $f(x) = x^n$ then $f'(x) = n x^{n-1}$