MATH 1060
List of formulas

Double –Angle Formulas:

$\sin(2x) = 2\sin x \cdot \cos x$ $\quad$ $\cos(2x) = \cos^2(x) - \sin^2(x) = 2\cos^2(x) - 1 = 1 - 2\sin^2(x)$

$\tan(2x) = \dfrac{2\tan x}{1-\tan^2(x)}$

Sum and Difference Formulas:

$\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v$ $\quad$ $\tan(u \pm v) = \dfrac{\tan u \pm \tan v}{1 \mp \tan u \cdot \tan v}$

$\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$

Law of Sines: $\frac{\sin\alpha}{a} = \frac{\sin\beta}{b} = \frac{\sin\gamma}{c}$ $\quad$ **Law of Cosines:** $a^2 = b^2 + c^2 - 2bc \cdot \cos\alpha$

Pythagorean Identities: $\sin^2\theta + \cos^2\theta = 1$ $\quad$ $1 + \tan^2\theta = \sec^2\theta$ $\quad$ $1 + \cot^2\theta = \csc^2\theta$

Angle θ between 2 vectors: $\cos\theta = \frac{\boldsymbol{u}\cdot\boldsymbol{v}}{|\boldsymbol{u}|\cdot|\boldsymbol{v}|}$

Dot product: $\boldsymbol{u} = \langle a, b\rangle$ *and* $\boldsymbol{v} = \langle c, d\rangle$; $\boldsymbol{u}\cdot\boldsymbol{v} = ac + bd$

Area of a triangle: $Area = \frac{1}{2}bc \cdot \sin\alpha$; $\quad$ $Area = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = (a+b+c)/2$

Reciprocal Identities: $\csc\theta = \dfrac{1}{\sin\theta}$ $\quad$ $\sec\theta = \dfrac{1}{\cos\theta}$ $\quad$ $\cot\theta = \dfrac{1}{\tan\theta}$

Quotient Identities: $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$ $\quad$ $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$

Inverse functions:

Function	Domain	Range
$y = \sin^{-1}(x)$ if and only if $\sin y = x$	$-1 \le x \le 1$	$-\frac{\pi}{2} \le y \le \frac{\pi}{2}$
$y = \cos^{-1}(x)$ if and only if $\cos y = x$	$-1 \le x \le 1$	$0 \le y \le \pi$
$y = \tan^{-1}(x)$ if and only if $\tan y = x$	$-\infty < x < \infty$	$-\frac{\pi}{2} < y < \frac{\pi}{2}$

Graphs of trigonometric functions: Characteristics of the graphs of $y = A\sin(Bx + C) + D$ and $y = A\cos(Bx + C) + D$

Amplitude= $|A|$ $\quad$ Period= $\dfrac{2\pi}{b}$ $\quad$ Vertical translation = D units upward (D>0) or downward (D<0)

Phase Shift: $-\frac{C}{B}$

Linear speed: $v = \frac{s}{t}$ $\quad$ **Angular speed:** $\omega = \frac{\theta}{t}$ $\quad$ **Circumference of circle: :** $C = 2\pi r = \pi d$