FORMULA SHEET

MATH 1060-004 Trigonometry

The following formulas will be provided on the Final Test.

Sum and Difference Formula

$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$
$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1-\tan A\tan B}$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1+\tan A\tan B}$$

Double Angle Formula

$$\sin(2A) = 2\sin A\cos A$$
$$\cos(2A) = \cos^2 A - \sin^2 A$$
$$\cos(2A) = 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\tan(2A) = \frac{2\tan A}{1-\tan^2 A}$$

Half Angle Formula

$$\sin(\frac{A}{2}) = \pm\sqrt{\frac{1-\cos(A)}{2}}$$
$$\cos(\frac{A}{2}) = \pm\sqrt{\frac{1+\cos(A)}{2}}$$
$$\tan(\frac{A}{2}) = \frac{1-\cos A}{\sin A} = \frac{\sin A}{1+\cos A}$$

Product to Sum

$$\cos A\cos B = \frac{1}{2}(\cos(A+B)+\cos(A-B))$$
$$\sin A\sin B = \frac{1}{2}(\cos(A-B)-\cos(A+B))$$
$$\sin A\cos B = \frac{1}{2}(\sin(A+B)+\sin(A-B))$$

Sum to Product

$$\sin A \pm \sin B = 2\sin(\frac{A\pm B}{2})\cos(\frac{A\mp B}{2})$$
$$\cos A - \cos B = -2\sin(\frac{A+B}{2})\sin(\frac{A-B}{2})$$
$$\cos A + \cos B = 2\cos(\frac{A+B}{2})\cos(\frac{A-B}{2})$$

Area of a Triangle

$$\begin{aligned}\text{Area} &= \frac{1}{2}ab\sin C = \frac{1}{2}bc\sin A\\ &= \frac{1}{2}ac\sin B = \sqrt{s(s-a)(s-b)(s-c)}\end{aligned}$$

where $s = \frac{a+b+c}{2}$

Law of Sines

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

Law of Cosines

$$\cos A = \frac{b^2+c^2-a^2}{2bc}$$
$$\cos B = \frac{a^2+c^2-b^2}{2ac}$$
$$\cos C = \frac{a^2+b^2-c^2}{2ab}$$

Vectors

$$\cos\theta = \frac{\vec{\mathbf{v}}\,.\,\vec{\mathbf{u}}}{\|\vec{\mathbf{v}}\|\|\vec{\mathbf{u}}\|}$$
$$\text{Proj}_{\vec{\mathbf{v}}}\vec{\mathbf{u}} = \frac{\vec{\mathbf{u}}\,.\,\vec{\mathbf{v}}}{\|\vec{\mathbf{v}}\|^2}\vec{\mathbf{v}}$$
$$\text{Work} = \vec{\mathbf{F}}\,.\overrightarrow{\mathbf{disp}}$$