Math 131 Unit 3 Formula sheet
For Triangles ABC with sides a, b, c

The Law of Sines
\[
\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}
\]

The Law of Cosines
\[
a^2 = b^2 + c^2 - 2bc \cos A
\]
\[
b^2 = a^2 + c^2 - 2ac \cos B
\]
\[
c^2 = a^2 + b^2 - 2ab \cos C
\]

Area
\[
\text{Area} = \frac{1}{2}bc \sin A
\]
\[
\text{Area} = \frac{1}{2}ac \sin B
\]
\[
\text{Area} = \frac{1}{2}ab \sin C
\]

Heron's Formula
Let \( s = \frac{a + b + c}{2} \) be the semiperimeter.
\[
\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}
\]

Unit Vector
\[
u = \frac{v}{\|v\|}
\]

Find a Vector from its Direction and Magnitude
\[
v = \|v\| (\cos \alpha \hat{i} + \sin \alpha \hat{j})
\]

Angle between Vectors
The angle, \( 0 \leq \theta \leq \pi \), between two vectors \( \mathbf{u} \) and \( \mathbf{v} \) is given by
\[
\cos \theta = \frac{\mathbf{u} \cdot \mathbf{v}}{\|\mathbf{u}\| \|\mathbf{v}\|}
\]