Precalculus **Midterm Formula Sheet**

arc length: $s = r \cdot \theta$

linear speed: $LS = \dfrac{r \cdot \theta}{t}$

angular speed: $AS = \dfrac{\theta}{t}$

Pythagorean identities:

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

$\tan^2 x + 1 = \sec^2 x$

$1 + \cot^2 x = \csc^2 x$

double angle identities:

$\sin(2x) = 2 \cdot \sin x \cdot \cos x$

$\cos(2x) = \cos^2 x - \sin^2 x$

$= 1 - 2\sin^2 x$

$= 2\cos^2 x - 1$

negative identities:

$\sin(-x) = -\sin x$

$\cos(-x) = \cos x$

sum and difference identities:

$\sin(x \pm y) = \sin x \cdot \cos y \pm \cos x \cdot \sin y$

$\cos(x \pm y) = \cos x \cdot \cos y \mp \sin x \cdot \sin y$

sinusoid function:

$y = a \cdot \sin\left[b(x - c)\right] + d$, where $|a|$ is amplitude; $b = \dfrac{2\pi}{\text{period}}$; $|c|$ is phase shift; $|d|$ is vertical shift

Law of Cosines (for *SSS, SAS*): $c^2 = a^2 + b^2 - 2 \cdot a \cdot b \cdot \cos C$

Law of Sines (for *ASA, AAS, SSA**): $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$ *ambiguous; two triangles test: $b \cdot \sin A < a < b$

Heron's formula: $A = \sqrt{s \cdot (s-a) \cdot (s-b) \cdot (s-c)}$,where $s = \dfrac{a+b+c}{2}$ (semiperimeter)

area of a triangle given *SAS*: $A = \dfrac{1}{2}ab\sin\theta$

polar to rectangular:

$x = r \cdot \cos\theta$

$y = r \cdot \sin\theta$

rectangular to polar:

$r^2 = x^2 + y^2$

$\tan\theta = \dfrac{y}{x}$

standard to trigonometric:

$z = a + bi$

$= |z| \cdot (\cos\theta + i \cdot \sin\theta)$

$|z| = \sqrt{a^2 + b^2}$

component form of vector:

$\mathbf{v} = \langle a, b \rangle$

$= \langle \|\mathbf{v}\| \cdot \cos\theta, \|\mathbf{v}\| \cdot \sin\theta \rangle$

$\|\mathbf{v}\| = \sqrt{a^2 + b^2}$ (magnitude)

$\theta =$ direction angle

dot product:

$\mathbf{v} \cdot \mathbf{w} = \langle a, b \rangle \cdot \langle c, d \rangle$

$= a \cdot c + b \cdot d$

angle between two vectors:

$\cos\theta = \dfrac{\mathbf{v} \cdot \mathbf{w}}{\|\mathbf{v}\| \cdot \|\mathbf{w}\|}$