Trigonometry Formulas

These four pages are permitted on the proctored final for Trig. Do not add any other notes to these pages! The proctor has been told to check the front and back of each page against his/her copy to make sure you have not added anything to these pages. If there are any additions, you will receive an F for cheating. Saying you did not understand the rules is not an excuse!

Formulas you need to Memorize:

You are responsible for knowing all other formulas not given below.
A few examples of formulas you need to know are:
Law of Cosines & Sines.
All formulas to find the area of a triangle.
Polar coordinate formulas from 8.5.

Sum & Difference Formulas:

$\cos(A + B)$

$= \cos(A)\cos(B) - \sin(A)\sin(B)$

$\cos(A - B)$

$= \cos(A)\cos(B) + \sin(A)\sin(B)$

$\sin(A + B)$

$= \sin(A)\cos(B) + \cos(A)\sin(B)$

$\sin(A - B)$

$= \sin(A)\cos(B) - \cos(A)\sin(B)$

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

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

Double Angle Formulas:

$\sin(2A) = 2\sin(A)\cos(A)$

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

$= 2\cos^2(A) - 1$

$= 1 - 2\sin^2(A)$

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

Half Angle Formulas:

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

$$\cos\left(\frac{A}{2}\right) = \pm\sqrt{\frac{1 + \cos(A)}{2}}$$

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

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

Product Sum Formulas:

(Trig Students Only)

$$\sin(x) + \sin(y) = 2\sin\left(\frac{x + y}{2}\right)\cos\left(\frac{x - y}{2}\right)$$

$$\sin(x) - \sin(y) = 2\sin\left(\frac{x - y}{2}\right)\cos\left(\frac{x + y}{2}\right)$$

$$\cos(x) + \cos(y) = 2\cos\left(\frac{x + y}{2}\right)\cos\left(\frac{x - y}{2}\right)$$

$$\cos(x) - \cos(y) = -2\sin\left(\frac{x + y}{2}\right)\sin\left(\frac{x - y}{2}\right)$$

Theorem:
(Trig Students Only)

$A\sin(x) + B\cos(x) = k\sin(x + \phi)$,
where $k = \sqrt{A^2 + B^2}$

$$\sin(\phi) = \frac{B}{k}, \quad \cos(\phi) = \frac{A}{k}$$

Complex Number Formula:
(Trig Students Only)

$z_1 = r_1[\cos(\theta_1) + i\sin(\theta_1)]$,
$z_2 = r_2[\cos(\theta_2) + i\sin(\theta_2)]$

$z_1 z_2$
$= r_1 r_2[\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2)]$

$$\frac{z_1}{z_2} = \frac{r_1}{r_2}[\cos(\theta_1 - \theta_2) + i\sin(\theta_1 - \theta_2)]$$

$z^n = r^n[\cos(n(\theta)) + i\sin(n(\theta))]$

$$z^{\frac{1}{n}} = r^{\frac{1}{n}}\left[\cos\left(\frac{\theta + 360^\circ \bullet k}{n}\right) + i\sin\left(\frac{\theta + 360^\circ \bullet k}{n}\right)\right]$$
where k = 0, 1, 2, …, n - 1

Law of Sines ambiguous case:
A is obtuse: $a \le b$: No solution
$a > b$: One solution

A is acute: $a < h$: No solution
$a = h$: One solution
$a > b$: One solution
$h < a < b$: Two solutions

Vectors:
$$|v| = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2}$$

$$\overrightarrow{PQ} = \langle q_1 - p_1, q_2 - p_2 \rangle$$
$$= \langle v_1, v_2 \rangle = v$$

$$\cos(\theta) = \frac{u \bullet v}{|u||v|}$$

Points of Special Interest on the Unit Circle: