

Elementary Engineering Mathematics

Equation Sheet #1 – Algebra/Trigonometry

Lines:

1. Slope of a line between two points $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$: $m = \frac{y_2 - y_1}{x_2 - x_1}$

2. A line through $P_1(x_1, y_1)$ with slope m (point-slope form): $y - y_1 = m(x - x_1)$

3. A line with y-intercept b and slope m (slope-intercept form): $y = mx + b$

Quadratics:

1. Quadratic formula for finding roots. If $y(x) = ax^2 + bx + c = 0$, then $x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

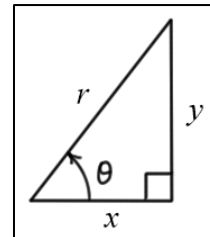
2. Completing the square:
 $y(x) = x^2 + 2ax + b = (x + a)^2 + (b - a^2)$
 $y(x) = x^2 - 2ax + b = (x - a)^2 + (b - a^2)$

3. Factoring: $y(x) = (x + a)(x + b) = x^2 + (a + b)x + (ab)$

Trigonometry:

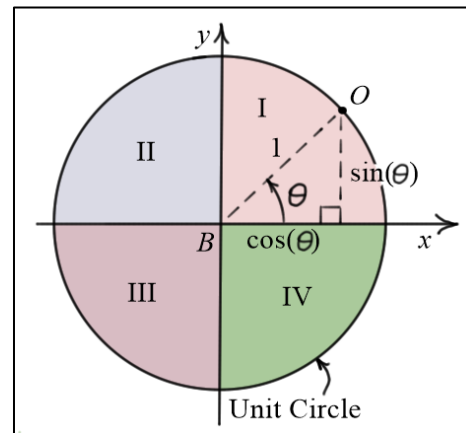
1. Right triangles:

$r^2 = x^2 + y^2$ $\sin(\theta) = (y/r)$ $\cos(\theta) = (x/r)$ $\tan(\theta) = (y/x)$



2. Trigonometric function values for commonly used angles

	0	30°	45°	60°	90°
$\sin(\theta)$	0	$1/2$	$\sqrt{2}/2$	$\sqrt{3}/2$	1
$\cos(\theta)$	1	$\sqrt{3}/2$	$\sqrt{2}/2$	$1/2$	0



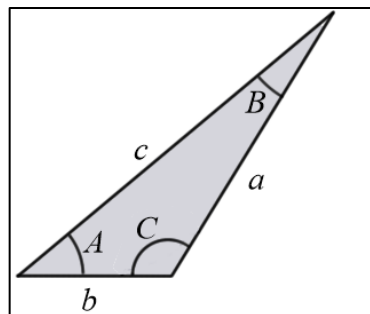
3. Non-right Triangles:

Law of Sines: $\sin(A)/a = \sin(B)/b = \sin(C)/c$

Law of Cosines: $a^2 = b^2 + c^2 - 2bc \cos(A)$

$b^2 = a^2 + c^2 - 2ac \cos(B)$

$c^2 = a^2 + b^2 - 2ab \cos(C)$



4. Useful Trigonometric identities:

$\sin^2(\theta) + \cos^2(\theta) = 1$
 $\sin(2\theta) = 2 \sin(\theta) \cos(\theta)$
 $\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta)$

$\sin(\theta + \phi) = \sin(\theta) \cos(\phi) + \cos(\theta) \sin(\phi)$
 $\cos(\theta + \phi) = \cos(\theta) \cos(\phi) - \sin(\theta) \sin(\phi)$