Grade 12 Math Cheat Sheet

Compose, invert and transform

Composition	**(f composed with g)(x) = f(g(x))**
Inverse on one-to-one domain	**g(f(x)) = x**
Transform a parent function	**y = A f(B(x − h)) + k**

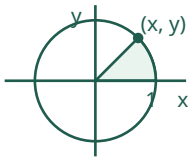
In composition, g(x) must belong to the domain of f.

For B != 0, move right by h and scale horizontal distances by 1/|B|.

Read the unit circle

Position at angle t	**(cos t, sin t)**
Circle equation	**$x^2 + y^2 = 1$**
Degrees to radians	**degrees × π/180**

Positive angles turn counterclockwise.



Pythagorean and reciprocal forms

Fundamental identity	**$\sin^2(t) + \cos^2(t) = 1$**
Divide by $\cos^2(t)$	**$1 + \tan^2(t) = \sec^2(t)$**
Divide by $\sin^2(t)$	**$1 + \cot^2(t) = \csc^2(t)$**
Quotient	**tan(t) = sin(t)/cos(t)**

sec = 1/cos, csc = 1/sin and cot = cos/sin where defined.

Graph a sinusoid

Model	**y = A sin(B(x − h)) + k**
Amplitude	**|A|**
Period, B != 0	**2π/|B|**
Phase shift and midline	**x shift h, y = k**

The period formula uses radians. A negative A reflects the wave across its midline.

Recognize centered conics

Circle	**$(x - h)^2 + (y - k)^2 = r^2$**
Ellipse	**$(x - h)^2/a^2 + (y - k)^2/b^2 = 1$**
Horizontal hyperbola	**$(x - h)^2/a^2 - (y - k)^2/b^2 = 1$**
Vertical parabola	**$(x - h)^2 = 4p(y - k)$**

The center is (h,k) for the first three. For the parabola it is the vertex.

Dot product and angle

Component product sum

$u \cdot v = u_x v_x + u_y v_y + u_z v_z$

Angle for nonzero vectors	**cos t = (u dot v)/(|u||v|)**
Perpendicular test	**u dot v = 0**

The perpendicular test describes an angle only when both vectors are nonzero.

Polar to rectangular coordinates

Horizontal component	**x = r cos θ**
Vertical component	**y = r sin θ**
Example	**(2, π/3) → (1, √3)**

In the example, the first pair gives radius and angle in radians; the second gives x and y.

A first limit

Away from x = 2	**$(x^2 - 4)/(x - 2) = x + 2$**
Approach 2 from either side	**$\lim_{x \to 2} (x + 2) = 4$**

The original fraction has no value at x = 2. Its nearby values approach 4.