

## Some Trigonometry Facts

### 1. Identities

- (a)  $\cos^2 x + \sin^2 x = 1$
- (b)  $\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$
- (c)  $\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$
- (d)  $\cos 2x = 1 - 2\sin^2 x = 2\cos^2 x - 1 = \cos^2 x - \sin^2 x$
- (e)  $\sin 2x = 2\sin x \cos x$
- (f)  $\cos^2 x = \frac{1}{2}(1 + \cos 2x)$
- (g)  $\sin^2 x = \frac{1}{2}(1 - \cos 2x)$
- (h)  $\cos \frac{x}{2} = \pm \sqrt{\frac{1 + \cos x}{2}}$
- (i)  $\sin \frac{x}{2} = \pm \sqrt{\frac{1 - \cos x}{2}}$

### 2. Inverse Trig Values

$\sin^{-1}(0) = 0$	$\cos^{-1}(1) = 0$	$\tan^{-1}(0) = 0$
$\sin^{-1}(\pm \frac{1}{2}) = \pm \frac{\pi}{6}$	$\cos^{-1}(\pm \frac{\sqrt{3}}{2}) = \frac{\pi}{6}, \frac{5\pi}{6}$	$\tan^{-1}(\pm \frac{\sqrt{3}}{3}) = \pm \frac{\pi}{6}$
$\sin^{-1}(\pm \frac{\sqrt{2}}{2}) = \pm \frac{\pi}{4}$	$\cos^{-1}(\pm \frac{\sqrt{2}}{2}) = \frac{\pi}{4}, \frac{3\pi}{4}$	$\tan^{-1}(\pm 1) = \pm \frac{\pi}{4}$
$\sin^{-1}(\pm \frac{\sqrt{3}}{2}) = \pm \frac{\pi}{3}$	$\cos^{-1}(\pm \frac{1}{2}) = \frac{\pi}{3}, \frac{2\pi}{3}$	$\tan^{-1}(\pm \sqrt{3}) = \pm \frac{\pi}{3}$
$\sin^{-1}(1) = \frac{\pi}{2}$	$\cos^{-1}(0) = \frac{\pi}{2}$	$\tan^{-1}(\pm \infty) = \pm \frac{\pi}{2}$

### 3. Derivatives

- (a)  $\frac{d}{dx} \cos x = -\sin x$
- (b)  $\frac{d}{dx} \sin x = \cos x$
- (c)  $\frac{d}{dx} \tan x = \sec^2 x$
- (d)  $\frac{d}{dx} \sec x = \sec x \tan x$
- (e)  $\frac{d}{dx} \cot x = -\csc^2 x$
- (f)  $\frac{d}{dx} \csc x = -\csc x \cot x$
- (g)  $\frac{d}{dx} \sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$
- (h)  $\frac{d}{dx} \cos^{-1} x = -\frac{1}{\sqrt{1-x^2}}$
- (i)  $\frac{d}{dx} \tan^{-1} x = \frac{1}{1+x^2}$

### 4. Integrals

- (a)  $\int \cos x \, dx = \sin x$
- (b)  $\int \sin x \, dx = -\cos x$
- (c)  $\int \tan x \, dx = -\ln |\cos x|$
- (d)  $\int \cot x \, dx = \ln |\sin x|$
- (e)  $\int \sec x \, dx = \ln |\sec x + \tan x|$
- (f)  $\int \csc x \, dx = -\ln |\csc x + \cot x|$