

Chapter 3. Differentiation

3.6 Differentiation of Trigonometric Functions

Trigonometric Functions

✓ denotes more important to remember.

$$\begin{aligned}
 \checkmark \quad (\sin x)' &= \cos x, \\
 \checkmark \quad (\cos x)' &= -\sin x, \\
 \checkmark \quad (\tan x)' &= \sec^2 x = \frac{1}{\cos^2 x}, \\
 \checkmark \quad (\cot x)' &= -\csc^2 x = -\frac{1}{\sin^2 x}, \\
 (\sec x)' &= \frac{\cos x}{\sin^2 x}, \\
 (\csc x)' &= \frac{\sin x}{\cos^2 x}.
 \end{aligned}$$

Higher Order Derivatives

$$\begin{aligned}
 (\sin x)' &= \cos x, & (\sin x)'' &= -\sin x, & (\sin x)''' &= -\cos x, & (\sin x)^{IV} &= \sin x, \\
 (\cos x)' &= -\sin x, & (\cos x)'' &= -\cos x, & (\cos x)''' &= \sin x, & (\cos x)^{IV} &= \cos x.
 \end{aligned}$$

Inverse Trigonometric Functions

$$\begin{aligned}
 \checkmark \quad (\arcsin x)' &= \frac{1}{\sqrt{1-x^2}}, \\
 (\arccos x)' &= -\frac{1}{\sqrt{1-x^2}}, \\
 \checkmark \quad (\arctan x)' &= \frac{1}{1+x^2}, \\
 (\operatorname{arccot} x)' &= -\frac{1}{1+x^2}, \\
 \checkmark \quad (\operatorname{arcsec} x)' &= \frac{1}{x\sqrt{x^2-1}}, \\
 (\operatorname{arccsc} x)' &= \frac{1}{x\sqrt{x^2-1}}.
 \end{aligned}$$