Inverse Trig Derivatives (3.6) and Integrals

Derivatives of Inverse Functions

- If g(x) and f(x) are inverses, then the following is true:

  f(g(x)) =

Selected values of a strictly monotonic function $g(x)$ and its derivative $g'(x)$ are shown on the table below.

x	-3	-1	1	4
$g(x)$	5	1	0	-3
$g'(x)$	-4	$-\frac{1}{5}$	$-\frac{1}{6}$	-2

a) Find $\left(g^{-1}\right)'(1)$

b) Find $\left(g^{-1}\right)'(-3)$

- Calculate g'(x), where g(x) is the inverse of the function f(x)= x^4 +10.

Inverse Trig Functions

- What does it mean if we have y = $\sin^{-1} x$?

- Find the derivative of y = $\sin^{-1} x$

- More generically…if we want the derivative of $y = \sin^{-1}\left(\frac{u}{a}\right)$

Examples:

$$\frac{d}{dx}(\arcsin\left(\frac{3x}{1}\right)) =$$

$$\frac{d}{dx}(\sin^{-1}\left(\frac{x}{4}\right)) =$$

$$\frac{d}{dx}(\arcsin\left(\frac{3x}{5}\right)) =$$

- Find the integral

$$\int \frac{2}{\sqrt{9-4x^2}}\,dx$$

- Find the definite integral (must consider range):

$$\int_{\frac{1}{2}}^{\frac{\sqrt{3}}{2}} \frac{1}{\sqrt{1-x^2}}\,dx$$

- Find the derivative of: $y = \tan^{-1} x$

- Integrate: $\int \frac{1}{16+9x^2}\,dx$

Other Inverse Trig Derivatives:

$$\frac{d(arc\cot x)}{dx}$$

$$\frac{d(\operatorname{arc}\csc x)}{dx}$$

$$\frac{d(arc\sec x)}{dx}$$

Inverse Trig Integrals:

$$\int \frac{1}{\sqrt{1-x^2}}\,dx$$

$$\int \frac{1}{1+x^2}\,dx$$

$$\int \frac{1}{x\sqrt{x^2-1}}\,dx$$

More Trig Integrals – just gotta memorize these ones.

$$\int \tan x\,dx$$

$$\int \cot x\,dx$$

$$\int \sec x\,dx$$

$$\int \csc x\,dx$$