Outcome 1
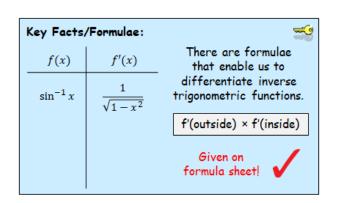
Derivatives of inverse trig functions – $\sin^{-1}x$

Worked Example:

Given $f(x) = \sin^{-1} 4x$, find $f'(x)$.

1. Sub into the formula.

$$f'(x) = \frac{1}{\sqrt{1-(4x)^2}} \times 4 = \frac{4}{\sqrt{1-16x^2}}$$

2. Multiply by the derivative of the function within the function and expand the bracket.

Key Facts/Formulae:

$f(x)$	$f'(x)$
$\sin^{-1} x$	$\dfrac{1}{\sqrt{1-x^2}}$

There are formulae that enable us to differentiate inverse trigonometric functions.

f'(outside) × f'(inside)

Given on formula sheet! ✓

Questions...

Differentiate each of the following with respect to x...

1 $f(x) = \sin^{-1} 5x$

2 $y = \sin^{-1} 9x$

3 $f(x) = \sin^{-1} 7x^2$

4 $y = \sin^{-1} x^3$

5 $f(x) = x \sin^{-1} 8x$

6 $y = 6x^2 \sin^{-1} 2x$

Answers

1 $f'(x) = \dfrac{5}{\sqrt{1-25x^2}}$

2 $\dfrac{dy}{dx} = \dfrac{9}{\sqrt{1-81x^2}}$

3 $f'(x) = \dfrac{14x}{\sqrt{1-49x^4}}$

4 $\dfrac{dy}{dx} = \dfrac{3x^2}{\sqrt{1-x^6}}$

5 $f'(x) = \dfrac{8x}{\sqrt{1-64x^2}} + \sin^{-1}8x$

6 $\dfrac{dy}{dx} = \dfrac{12x^2}{\sqrt{1-4x^2}} + 12x\,\sin^{-1}2x$