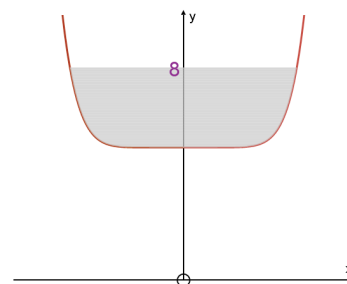# Differentiating Inverse Functions

Starter

1.   **(Review of last lesson)**
        The curve shown is $y = 3x^8 + 5$. Find the shaded area.

2.   Let $y = \dfrac{5x - 3}{2}$. Find:

        (a) $\dfrac{dy}{dx}$
        (b)   the inverse function
        (c)   the derivative of the inverse function.
        Write down what you notice.

Notes

If $y = f(x)$ then $y = f^{-1}(x)$ is the inverse function.

The derivative of the inverse function is $\dfrac{dx}{dy} = 1 \div \dfrac{dy}{dx} = \dfrac{1}{\frac{dy}{dx}}$ (i.e. the reciprocal)

E.g. 1 Use the derivative of e^x to prove that the derivative of $\ln x$ is $\dfrac{1}{x}$.

E.g. 2 The deceleration of a parachute is proportional to the square of its velocity, so that
$a = \dfrac{dv}{dt} = -0.05v^2$. When $t = 0$ the velocity is 12 m/s. Find an expression for the
velocity in terms of time.
        Hint: $\dfrac{dt}{dv} = -\dfrac{1}{0.05v^2}$ so $t = \displaystyle\int \ldots$

Video A: **Differentiating inverse functions**
Video B: **Differentiating inverse functions**

Solutions to Starter and E.g.s

Exercise
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Summary

For the inverse function $y = f^{-1}(x)$ the derivative is $\dfrac{dx}{dy} = 1 \div \dfrac{dy}{dx} = \dfrac{1}{\frac{dy}{dx}}$