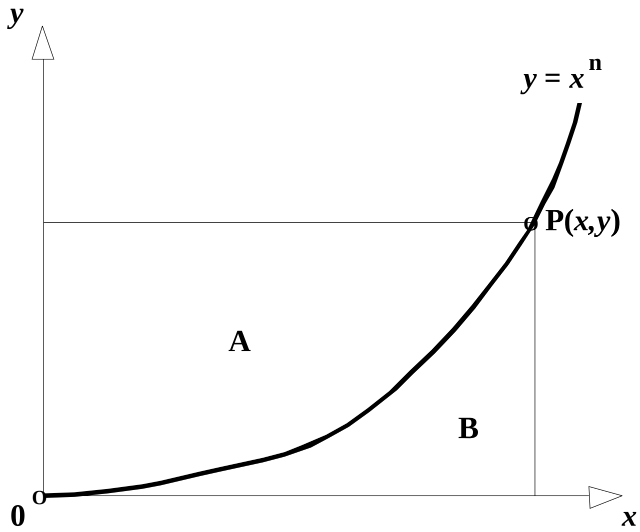
**Go straight to the integral power rule**




A rectangle is drawn from P on the curve of $y = x^n$
Its area is A + B and is also $xy$ , so $A + B = xy$ (Eq 1)

It can be shown that $\frac{A}{B} = n \quad \therefore A = Bn$

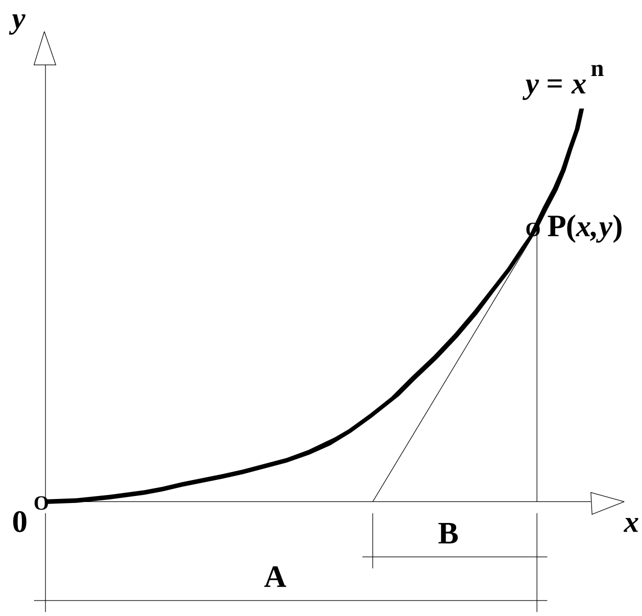
Substituting in Eq 1, we get $Bn + B = xy$

Simplifying, we get $B(n+1) = xy \quad \therefore B = \frac{xy}{n+1}$

And since $xy = x^{n+1}$ then $B = \frac{x^{n+1}}{n+1}$ , which is

simply the integral power rule: $\int \boldsymbol{x^n dx = \frac{x^{n+1}}{n+1}}$

**Go straight to the differential power rule**




A right triangle is drawn with apex at P on the curve of $y = x^n$ and has tangent and ordinate down to the *x*-axis

The tangent has gradient $m = \frac{y}{B} \quad \therefore m = \frac{x^n}{B}$ (Eq 2)

It can be shown that $\frac{A}{B} = n \quad \therefore \frac{x}{B} = n \quad \therefore B = \frac{x}{n}$

Substituting in Eq 2, we get $m = \frac{x^n}{\frac{x}{n}} \quad \therefore m = nx^{n-1}$

But at P the gradient of the curve is equal to the gradient of the tangent, so the gradient of the curve is also $nx^{n-1}$

which is simply the differential power rule: $\boldsymbol{\frac{dy}{dx} = nx^{n-1}}$