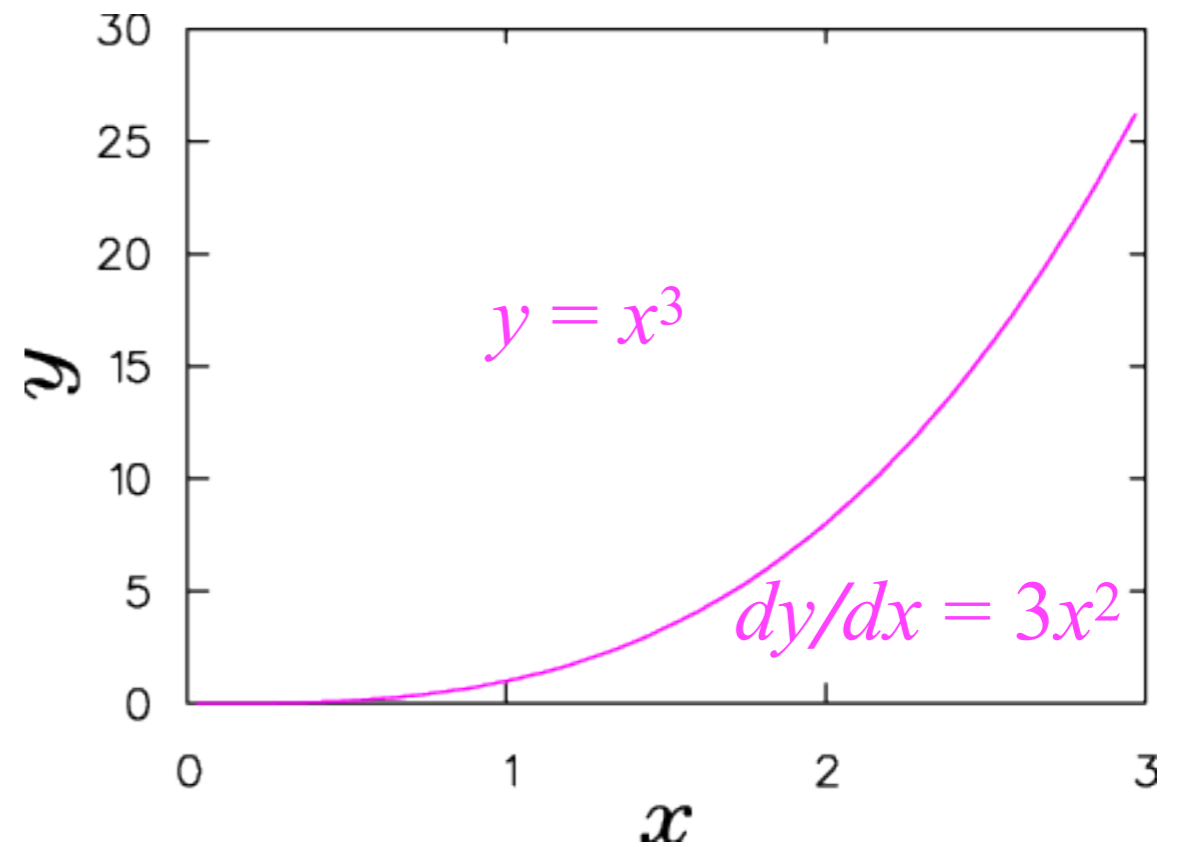
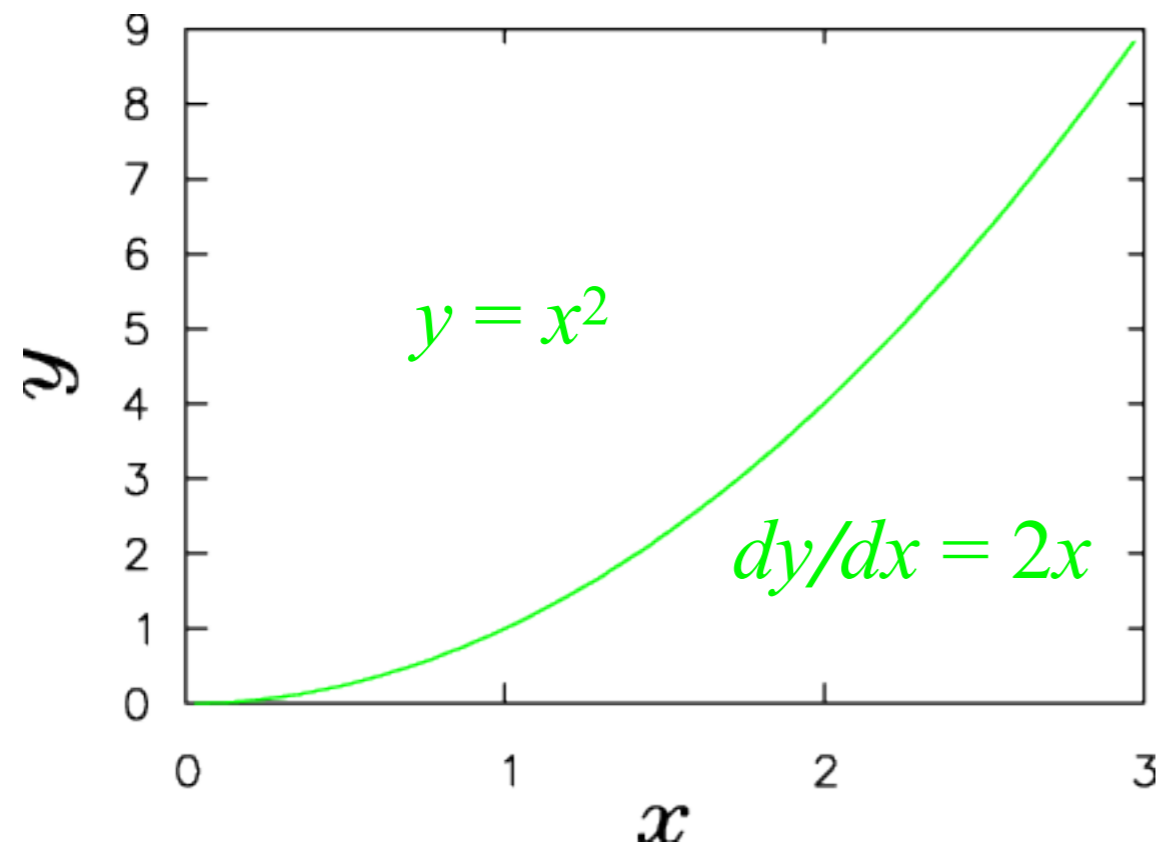
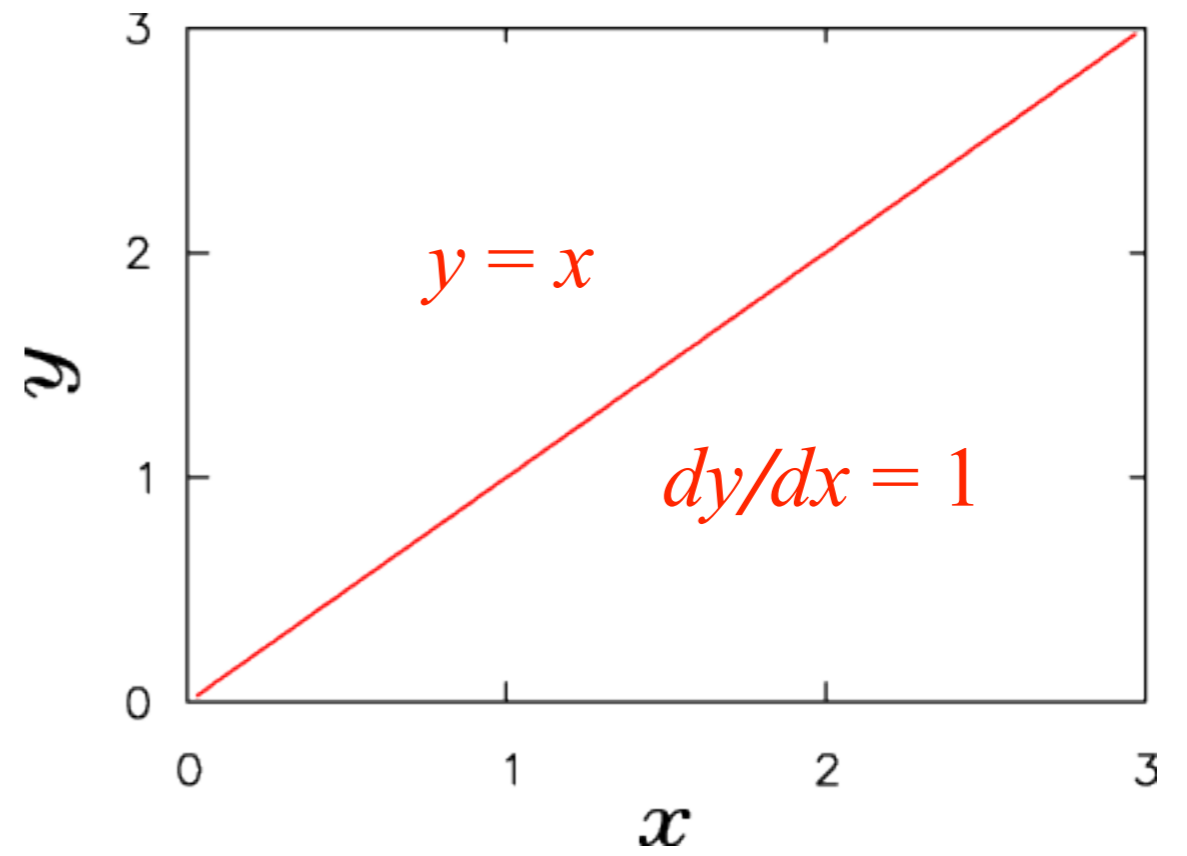
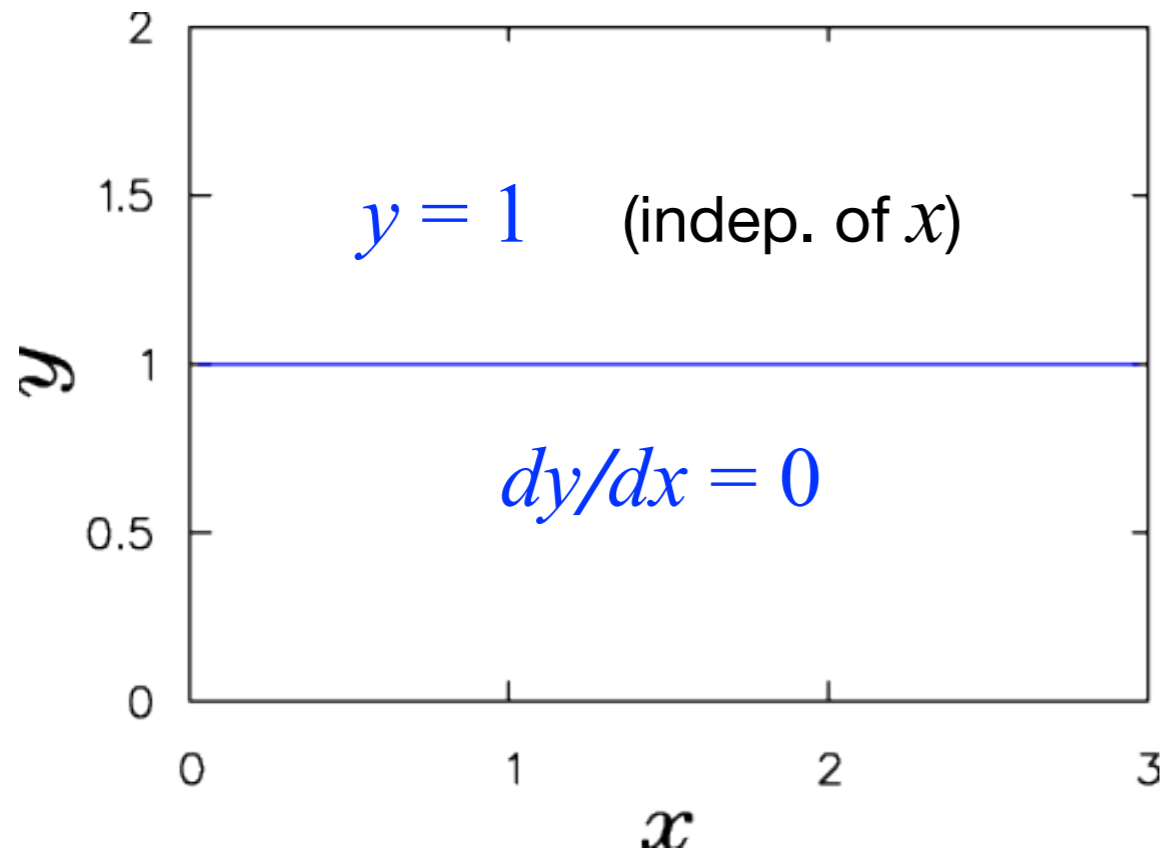


DIFFERENTIAL EQUATIONS

Jess H. Brewer

Guess the Function *and its Derivative*:



Recall the function *defined* by

$$dy/dx = y$$

[$y(x)$ is its own derivative.]

Thus it's also its own *second* derivative...
and *third* derivative... and n^{th} derivative.

We tried to express $y(x)$ as a simple *polynomial*

$$y(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \dots$$

and found $y(x) = \sum_{n=0}^{\infty} x^n/n! \equiv \exp(x) \equiv e^x$

That was an example of *solving a differential equation!*

Similarly, if

$$dy/dx = 1/x \equiv x^{-1}$$

we know that

$$y(x) = \ln(x) + \text{const.}$$

(Another ***differential equation*** solved!)

How about something a little more complicated?

$$d^2y/dx^2 + 2dy/dx = 3e^x$$

$$y(x) = e^x$$

again!

(Some ***differential equations***

look harder than they are!)

How about an example from
Physics?

Simple
Harmonic
Motion