Derivatives of common functions

You have to know all of this forever and ever.

- Constants don't change:
$$\frac{d}{dx}(c) = 0, \ c \in \mathbb{R}.$$
- Linearity:
$$\frac{d}{dx}(f(x) + g(x)) = \frac{df}{dx} + \frac{dg}{dx}, \ \frac{d}{dx}(cf(x)) = c\frac{df}{dx}, \ c \in \mathbb{R}.$$
- Product rule:
$$(fg)' = f'g + fg'$$
- Quotient rule:
$$\left(\frac{f}{g}\right)' = \frac{gf' - fg'}{g^2}$$
- Chain rule:
$$[f(g(x))]' = f'(g(x))g'(x)$$
- Fundamental theorem of calculus: Suppose f is continuous on an open interval containing a and x.
$$\text{If } F(x) := \int_a^x f(t)dt, \text{ then } \frac{dF}{dx} = f.$$
- Power functions:
$$\frac{d}{dx}(x^n) = nx^{n-1}.$$
- Exponential and logarithmic functions:
$$\frac{d}{dx}(a^x) = a^x \ln a, \ \frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}, \text{ for } a > 0 \text{ constant}$$
- Trigonometric functions:
$$(\sin x)' = \cos x, \ (\cos x)' = -\sin x, \ (\tan x)' = \sec^2 x,$$
$$(\csc x)' = -\csc x \cot x, \ (\sec x)' = \sec x \tan x, \ (\cot x)' = -\csc^2 x.$$
- Inverse trigonometric functions:
$$\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1 - x^2}}, \ \frac{d}{dx}(\arccos x) = \frac{-1}{\sqrt{1 - x^2}}, \ \frac{d}{dx}(\arctan x) = \frac{1}{1 + x^2},$$