Derivatives of Simple Functions.

- **Constant Functions**: c (not depending on x). Examples $f(x) = 5$, $g(x) = e$, $h(x) = \ln(2)$.

  $$\frac{d}{dx}\, c \;=\;$$

- **Power Functions**: x^a. Examples: x^3, $x^{2/3} = \sqrt[3]{x^2}$, $x^{-4} = 1/x^4$.

  $$\frac{d}{dx}\, x^a \;=\;$$

- **Exponential Functions**: a^x $(a > 0,\ a \neq 1)$. Examples: 2^x, $(1/3)^x$, e^x.

  $$\frac{d}{dx}\, e^x \;=\;$$

  $$\frac{d}{dx}\, a^x \;=\;$$

- **Logarithmic Functions**: $\log_a x$ $(a > 0,\ a \neq 1)$. Examples: $\log_2 x, \log x, \ln x$.

  $$\frac{d}{dx}\, \ln x \;=\;$$

  $$\frac{d}{dx}\, \log_a x \;=\;$$

Differentiation Rules.   Suppose a and b are constants and f and g are differentiable functions.

- **Constant Multiple Rule, Sum and Difference Rules**:

  $$\frac{d}{dx}\left(af(x) \pm bg(x)\right) \;=\;$$

- **Product and Quotient Rules**:

  $$\frac{d}{dx}\, f(x) \cdot g(x) \;=\;$$

  $$\frac{d}{dx}\, \frac{f(x)}{g(x)} \;=\;$$

- **Chain Rule**:

  $$\frac{d}{dx}\, f(g(x)) \;=\;$$

Simple Antiderivatives.

- **Constant Functions**: c (not depending on x),

  $\int c \, dx \;=\;$

- **Some Power Functions**: x^a $(a \neq -1)$,

  $\int x^a \, dx \;=\;$

- **Exponential Functions**: a^x $(a > 0, a \neq 1)$,

  $\int e^x \, dx \;=\;$

  $\int a^x \, dx \;=\;$

- **The Reciprocal Function**: $1/x = x^{-1}$

  $\int \frac{1}{x} \, dx \;=\;$

Substitution: $\int f(u(x)) \, u'(x) \, dx \;=\; \int f(u) \, du$

- $\int (3x + 4)^8 \, 3dx \;=\;$

- $\int (4x + 1)^9 \, dx \;=\;$

- $\int (1 - x)^6 \, dx \;=\;$

- $\int 2x \, e^{x^2} \, dx \;=\;$

- $\displaystyle \int \frac{1}{2x - 1} \, dx \;=\;$