# Functions

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# Exponents and Logarithms

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  - Othertimes, it means $\log_e(n) = ln(n)$

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$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n \qquad \forall a, b \neq 0$$

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$$\frac{\log_x n}{\log_x m} = \log_m n$$

# You try!

$$2^4$$

$$\log(100)$$

$$a^3 \times a^7$$

$$\log_{10}(10z)$$

# Functions

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    - $y$ is the *output* from the function

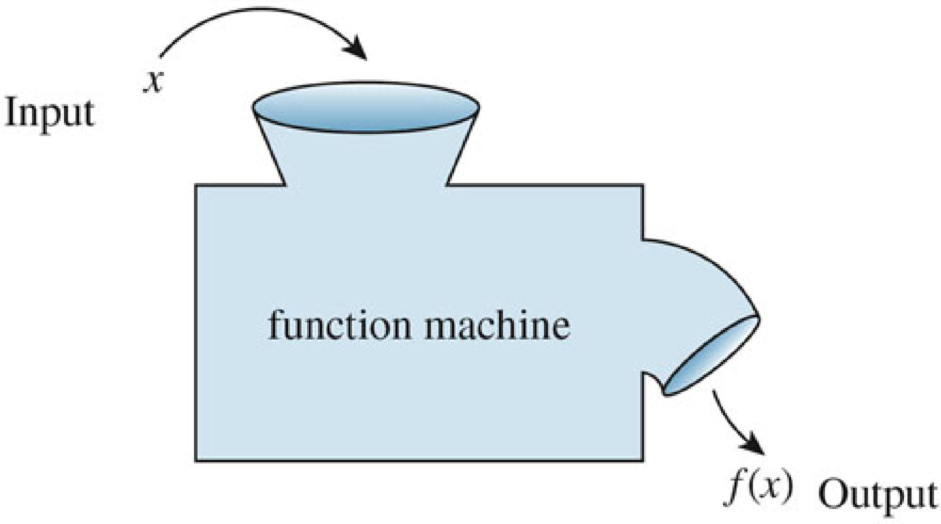


Figure 1:

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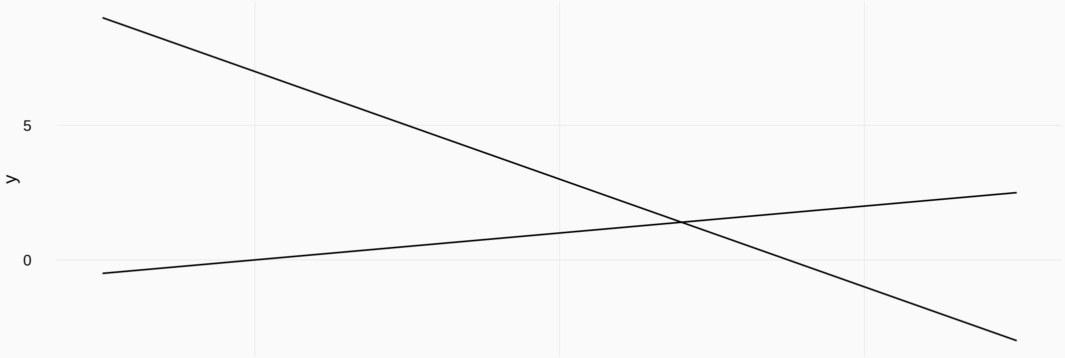
    - $m$ is the slope (for every one unit increase in $x$, $y$ increases $m$ units)
    - $b$ is the y-intercept: the value of $y$ when $x = 0$

# Linear functions

```
ggplot(data.frame(x = c(-3, 3)), aes(x)) +
  stat_function(fun = function(x) -2 * x + 3, geom = "line")  +
  stat_function(fun = function(x) (1 / 2) * x + 1)
```



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# Quadratics

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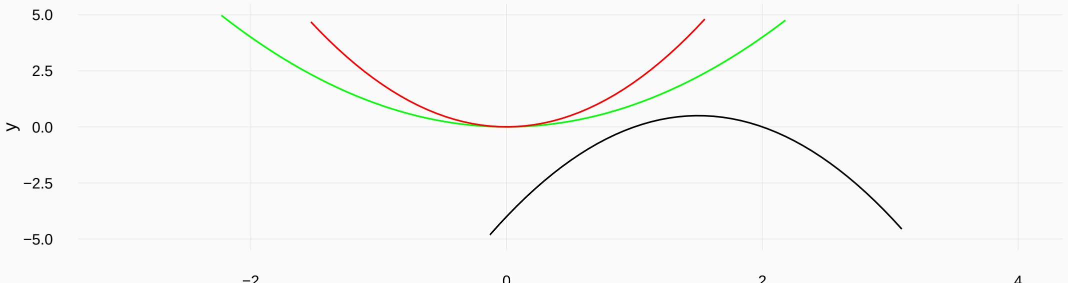
- $y = ax^2 + bx + c$

# Quadratics

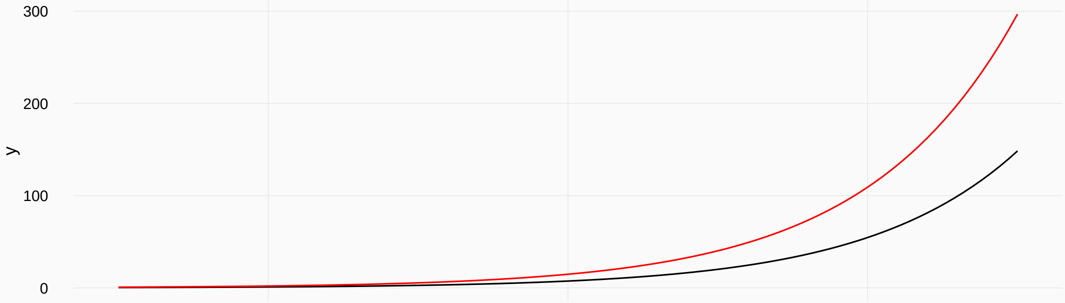
```
ggplot(data.frame(x = c(-3, 4)), aes(x)) +
  stat_function(fun = function(x) x ^ 2, color = "green") +
  stat_function(fun = function(x) 2 * x ^ 2, color = "red") +
  stat_function(fun = function(x) -2 * x ^ 2 + 6 * x - 4) +
  ylim(c(-5, 5))
```



# Exponential

- General form: $y = a * b^{kx} + k$

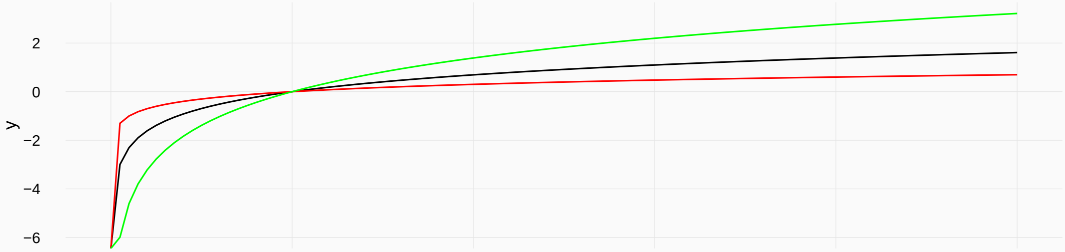
```
ggplot(data.frame(x = c(-1, 5)), aes(x)) +
  stat_function(fun = function(x) exp(x)) +
  stat_function(fun = function(x) 2 * exp(x), color = "red")
```



# Logs

- General form: $y = a * \log(bx) + k$

```
ggplot(data.frame(x = c(0, 5)), aes(x)) +
  stat_function(fun = function(x) log(x)) +
  stat_function(fun = function(x) log10(x), color = "red") +
  stat_function(fun = function(x) 2 * log(x), color = "green")
```



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- In fact, these functions are each others “inverse” function
    - Plug in $y$ to find $x$
- Exponents have horizontal asymptote
- Logs have vertical asymptote

# You try!

What function describes this line?