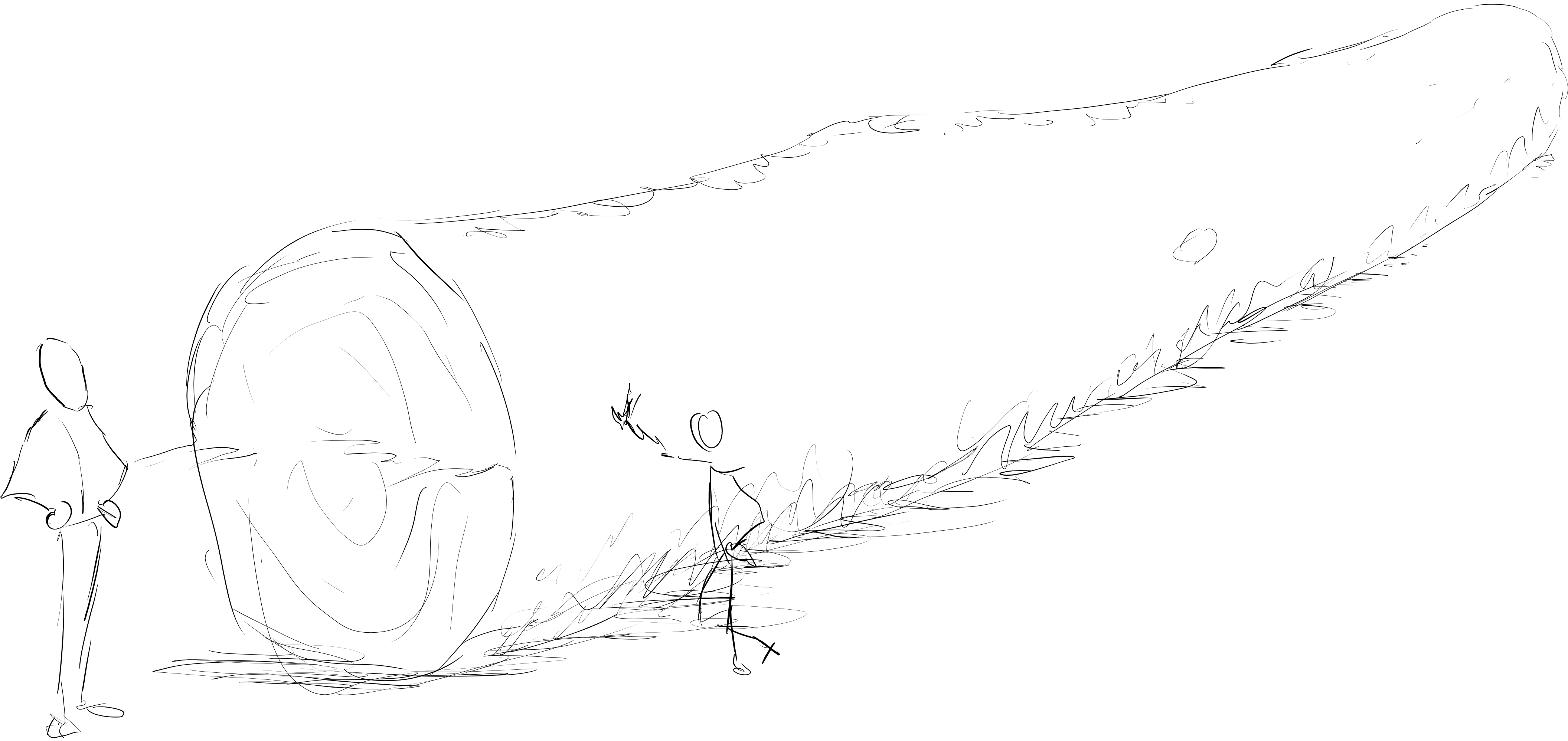

$$\log_b(x) = y \quad \equiv \quad b^y = x$$

$$\log_{2.7}(-3) = \qquad\qquad 2.7^{\boxed{}} = -3$$

$$\log_b : \mathbb{R}^+ \longrightarrow \mathbb{R} \qquad\qquad 2^{-2} = \frac{1}{4}$$

Take 3 of 50

$$50^3$$

$$|\text{strings of length } x| = |\text{characters}|^x$$

$$\{0, 1, 2 \ldots 9\}$$

$$|\text{8-digit numbers}| = 10^8 \underbrace{- 10^7 - 10^6 - 10^5 - \ldots 10^1}_{\text{leading zero}}$$

if I want to rep integers num up to y

how many digits do I need

$\lceil \log_{10}(y) \rceil$ (+1 if leading zeros do not matter)

log identities

$$x^{a+b} = x^a x^b$$

$$\log_b(x) = y \equiv b^y = x$$

$$\log_b(x) = y+z$$

$$b^{y+z} = x$$

$$\parallel$$

$$b^y b^z = pq$$

$$\log_b(pq) = y+z$$

$$\boxed{\log_b(pq) = \log_b(p) + \log_b(q)}$$

product rule

$$\log_b(PQ) = \log_b(P) + \log_b(Q)$$

$$\log_b(x^y) = \log_b(\underbrace{x \cdot x \cdot x \cdots x}_{y}) = \underbrace{\log_b(x) + \log_b(x) + \cdots + \log_b(x)}_{y} = y\log_b(x)$$

$$\log_b\left(\frac{x}{y}\right) = \log_b(x \cdot y^{-1}) = \log_b(x) + \log_b(y^{-1}) = \log_b(x) - \log_b(y)$$

$$\log_6(52000) - \log_6(5200) = \log_6\left(\frac{52000}{5200}\right) = \log_6(10)$$

base 10

base 2

$$\log_b(x) = \frac{\log_q(x)}{\log_q(b)}$$

$\log(x)$

$\log_2 = \lg$

$\log_e = \ln$

$\log_{10}$

base 4

base 2

1 2 3 4

a b

$\downarrow 3$

$\downarrow 6$

$4^3 = (2 \cdot 2)^3 = 2^6$

2^6

x

$4^x = (2 \cdot 2)^x = 2^{2x}$

$\boxed{\log_2(4^x)} = 2x = \log_2(4)\, x = \log_2(4) \log_4(x)$

$$3.1415 \times 10^{3}$$