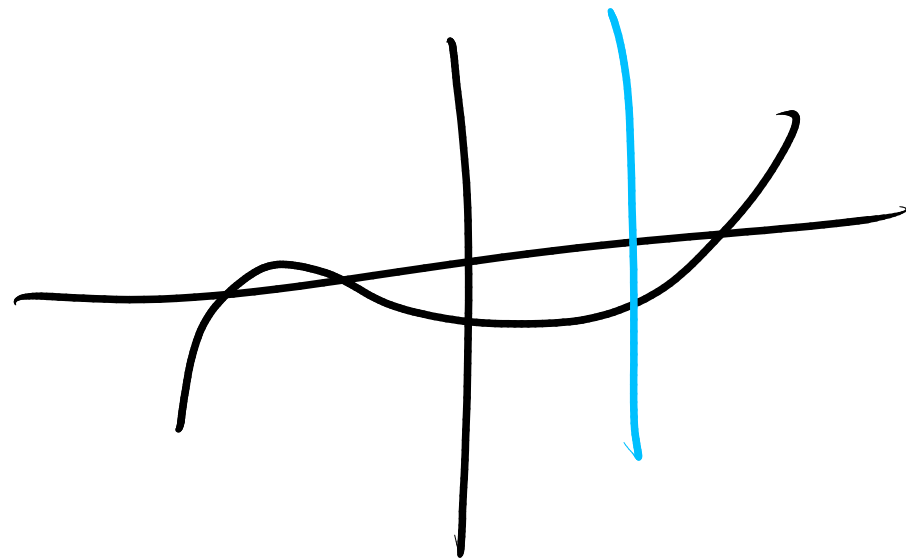


§ 1 Functions and limits

§ 1.1 Quick Review

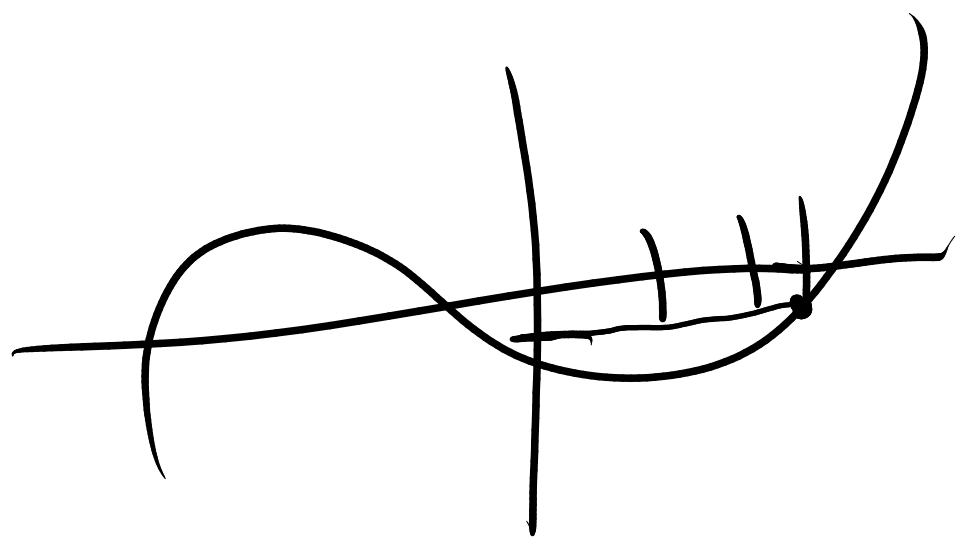
What is a function?

A rule that assigns one output to each input



passes
vertical line test

Study fns that take in
one real #
output one real #



$$f(x) = 3x^2 - 5$$

$$f(0) = -5$$

$$f(1) = -2$$

$$f(3) = 3(3^2) - 5 = 22$$

$$f(-3) = 22$$

Common fns

$$f(x) = x \quad \text{Identity fns}$$

$$f(x) = 2 \quad \text{Constant fns}$$

Linear fns

$$f(x) = mx + b$$

Quadratics

$$f(x) = ax^2 + bx + c$$

$$\text{if } ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a^2 + b^2$$

$$\neq (a+b)^2 = a^2 + 2ab + b^2$$

$$(a+b)(a-b) = a^2 - b^2$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

Polynomials

$$f(x) = a_0 + a_1x + a_2x^2 + \dots + a_nx^n$$

Rational Functions

$$\frac{\text{poly}}{\text{poly}} \quad f(x) = \frac{x^2 + 1}{x - 4}$$

$$f(1) = -\frac{2}{3}$$

undefined at 4.

Fractional exponents

$$\sqrt{4} = 2 \quad \sqrt[3]{8} = 2$$

$$9^{3/2} = (\sqrt{9})^3 = (3)^3 = 27.$$

$$8^{3/2} = 8^{3/2}$$

↑ algebraic

Trig functions

always radians.

$$\sin = \frac{\text{opp}}{\text{hyp}}$$

= y value

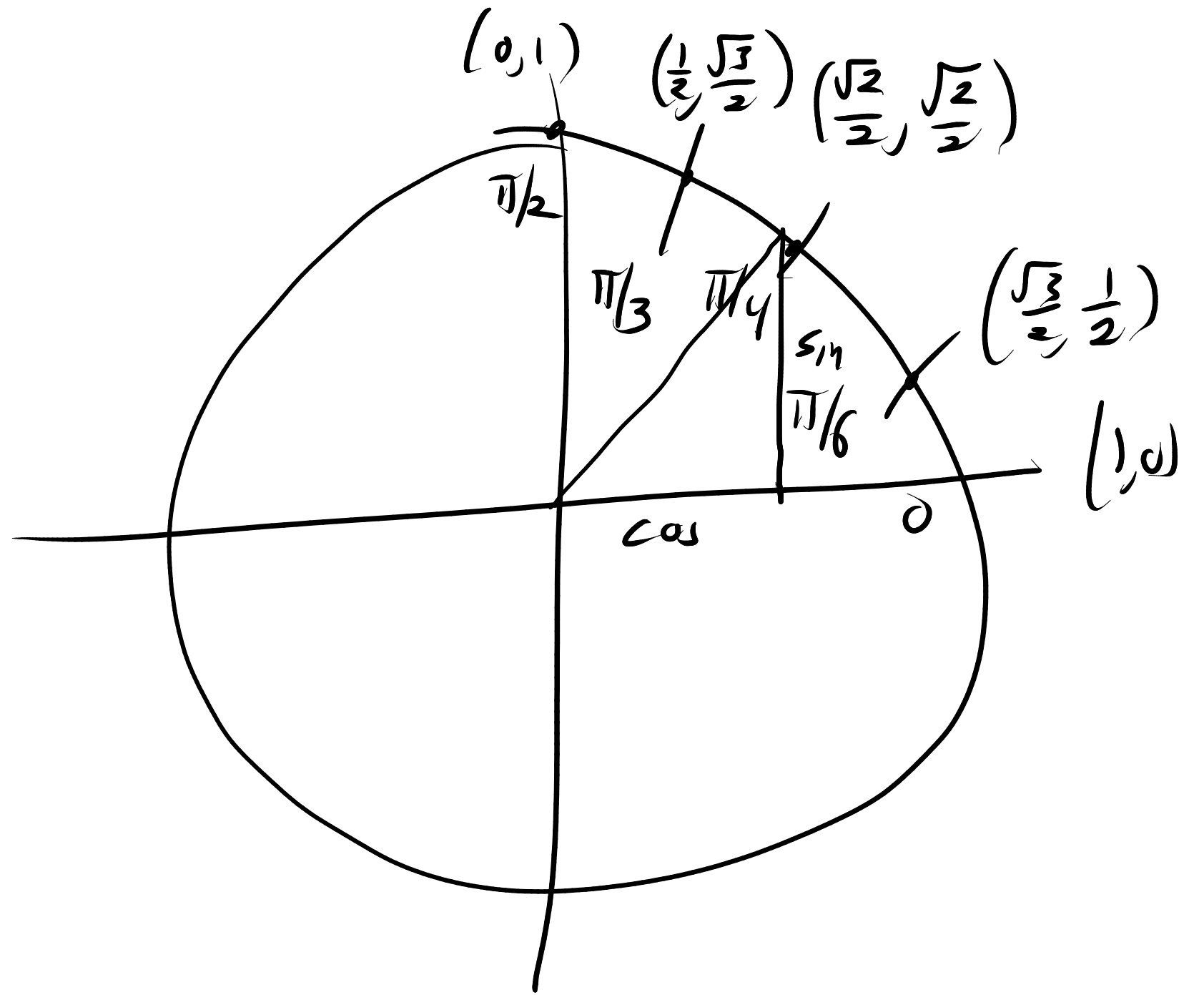
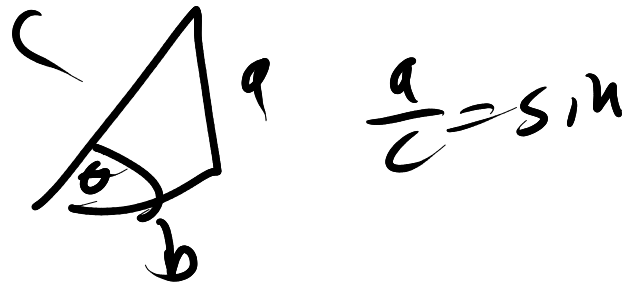
$$\cos = \frac{\text{adj}}{\text{hyp}} = x\text{-coord}$$

$$\tan(x) = \frac{\sin(x)}{\cos(x)}$$

$$\cot(x) = \frac{\cos(x)}{\sin(x)}$$

$$\sec(x) = \frac{1}{\cos(x)}$$

$$\csc(x) = \frac{1}{\sin(x)}$$



Trigonometric identities

Pythagorean Identity

$$\cos^2(x) + \sin^2(x) = 1.$$

$$\sin(x+y) = \sin(x)\cos(y) + \cos(x)\sin(y).$$

Set and interval notation

$$\{x \mid x \geq 3\}$$

open interval $(3, 6) = \{x \mid 3 < x < 6\}$

closed interval $[3, 6] = \{x \mid 3 \leq x \leq 6\}$

half-open interval $(3, 6] = \{x \mid 3 < x \leq 6\}$.

§ 1.2 Approximation

Q: What is $\sqrt{4}$? 2.

Q: What is $\sqrt{5}$? $5^{1/2}$
btwn 2 and 3

A: close to 2.

high temps in DC

Aug 25 2022: 88

Aug 26 2022: 91

Aug 27 2022: 88

Aug 28 2022: 90

Good

Jan 1 2022: 59

Jan 2 2022: 63

Jan 3 2022: 30.

Bad

Mileage Average Price

36000 \$11500

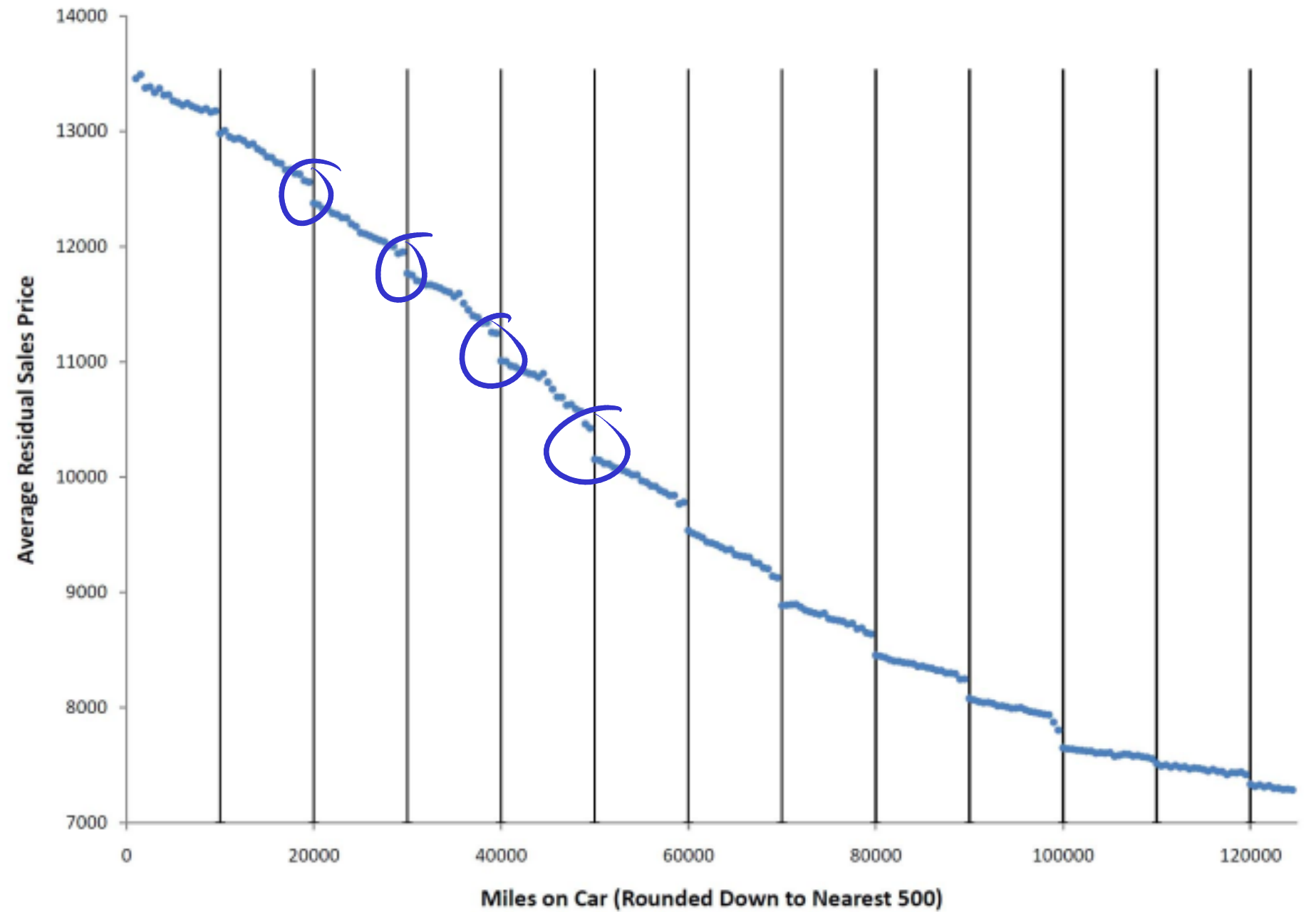
37000 \$11400

38000 \$11350

39000 \$11250

40,000 \$11,200?

\$11,000



Bad! jumps