

GRAPHS

- 1 Domain
- 2 Intersection with x -axis $\rightarrow f(x) = 0$
Intersection with y -axis $\rightarrow f(0) = y$
- 3 Symmetries

$$f(-x) = +f(x) \rightarrow \text{even}$$

$$f(-x) = -f(x) \rightarrow \text{odd}$$

$$\text{Periodicity} \rightarrow f(x + T) = f(x)$$

- 4 Asymptotes:

$$\text{Vertical} \rightarrow \lim_{x \rightarrow x_0} f(x) = \pm\infty$$

$$\text{Horizontal} \rightarrow \lim_{x \rightarrow \pm\infty} f(x) = H$$

$$\text{Oblique} \rightarrow \lim_{x \rightarrow \pm\infty} f(x) - (mx + b) = 0 \rightarrow m = \lim_{x \rightarrow \infty} \frac{f(x)}{x}$$

$$b = \lim_{x \rightarrow \infty} (f(x) - mx)$$

- 5 Continuity: $\lim_{x \rightarrow x_0} f(x) = f(x_0)$

- 6 Derivative: monotonicity and critical points

$$f'(x) > 0 \text{ increasing}$$

$$f'(x) < 0 \text{ decreasing}$$

$$f'(x) = 0 \text{ or } f'(x) \text{ does not exist} \rightarrow \text{critical points}$$

- 7 Local maxima and minima: $x_0 \rightarrow$ critical point

$$f'(x_0) = 0, f''(x_0) > 0 \quad \text{local minimum}$$

$$f'(x_0) = 0, f''(x_0) < 0 \quad \text{local maximum}$$

$$f'(x) : - \mapsto + \quad \text{local minimum}$$

$$f'(x) : + \mapsto - \quad \text{local maximum}$$

- 8 Concavity

$$f''(x) > 0 \text{ convex}$$

$$f''(x) < 0 \text{ concave}$$

- 9 Inflection points. Concavity changes. $f''(x_0) = 0$ or $\nexists f''(x_0)$

- 10 Global maxima and minima