

Curve sketching

1. Determine **domain** of f : (a) Determine x for which $f(x)$ is undefined. Do any values of x correspond to holes or vertical asymptotes?

Find x -intercepts of $f(x)$: (b) Determine x for which $f(x) = 0$.

Make a **sign chart** for f : $\leftarrow \text{-----} \rightarrow x$

2. List any **known points** on the graph of f (e.g. obvious intercepts).

3. Study **end behavior** and identify any horizontal, slant, or polynomial asymptotes (consider how $f(x)$ behaves as $x \rightarrow \pm\infty$).

4. Find **critical numbers** of f : (a) Determine x for which $f'(x)$ is undefined, and (b) Determine x for which $f'(x) = 0$.

Make a **sign chart** for f' : $\leftarrow \text{-----} \rightarrow x$

5. Use the sign chart for f' to identify intervals on which $f(x)$ is **increasing or decreasing** with increasing x . At locations other than critical points of f , determine the sign of $f'(x)$.

$f'(x) > 0$	$f(x)$ is inc. with inc'ing x	e.g. " f is increasing for all x on _____ (intervals)
$f'(x) < 0$	$f(x)$ is dec. with inc'ing x	because $f'(x) > 0$ for all x on _____ (intervals)."

6. **Identify relative extrema.**

e.g. " f has a relative (maximum/minimum) value of _____ (function value) at $x = \underline{\hspace{2cm}}$ because $f'(x)$ changes from (positive/negative) to (negative/positive) at $x = \underline{\hspace{2cm}}$."

7. Find **critical numbers** of f' : (a) Determine x for which $f''(x)$ is undefined, and (b) Determine x for which $f''(x) = 0$.

Make a **sign chart** for f'' : $\leftarrow \text{-----} \rightarrow x$

8. Use the sign chart for f'' to identify intervals on which the graph of f is **ccu or ccd**. At locations other than critical points of f' , determine the sign of $f''(x)$.

$f''(x) > 0$	Graph of f is ccu	e.g. " f is ccu for all x on _____ (interval) because
$f''(x) < 0$	Graph of f is ccd	$f''(x) > 0$ for all x on _____ (interval)."

9. Use the sign chart for f'' to identify **points of inflection** for f .

If at x ,

- $f''(x)$ changes sign
- tangent to graph of f exists (disregard for AP Calculus)

then, $(x, f(x))$ is p.o.i.

e.g. " f has a p.o.i. at $(\ , \)$ because $f''(x)$ changes from _____ tive to _____ tive at $x = \underline{\hspace{2cm}}$."

10. **Sketch** curve.

- Mark any **vertical asymptotes**.
- Draw any **known points**.
- Lightly sketch **end behavior**, if known.
- Lightly sketch a field of **sloped** line segments.
- Lightly sketch a field of **curved** segments locally consistent with the field of slopes.
- Trace** a curve that
 - Passes through the known points
 - Mimics every sketched arc segment through which it passes

