Curve sketching

1. Determine **domain** of f:
   (a) It can be easier to determine, instead, x for which $f(x)$ is **un**defined.
   Do any values of x correspond to holes or vertical asymptotes?
2. Find x**-intercepts** of $f(x)$: Determine x for which $f(x) = 0$.
3. Make a **sign chart** for f.
4. List any **known points** on the graph of f (e.g. obvious intercepts).
5. Study **end behavior** and identify any horizontal, slant, or polynomial asymptotes (consider how $f(x)$ behaves as $x \to \pm\infty$).
6. Find **critical numbers** of f:
   (a) Determine x for which is $f'(x)$ DNE, and
   (b) Determine x for which $f'(x) = 0$.
7. Make a **sign chart** for f'.
8. Use the sign chart for f' to identify intervals on which $f(x)$ is **increasing** or **decreasing** with increasing x.

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

9. Use the sign chart for f' and the 1st derivative test for continuous functions to identify **local extrema**.

where $f'(x)$ changes sign from $+ \to -$	$f(x)$ has local max	e.g. "f has a local (max/min) value of ____ at $x =$ _____ because $f'(x)$ changes from (+/-)ive to (-/+)ive at $x =$ _____."
where $f'(x)$ changes sign from $- \to +$	$f(x)$ has local min	

10. Find **critical numbers** of f':
    (a) Determine x for which $f''(x)$ DNE, and
    (b) Determine x for which $f''(x) = 0$.
11. Make a **sign chart** for f''.
12. Use the sign chart for f'' to identify intervals on which the graph of f is **ccu** or **ccd**.

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

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

If at x,	then	
• $f''(x)$ changes sign • tangent to graph of f exists (disregard for AP)	$(x, f(x))$ is a p.o.i. of f.	e.g. "f has a p.o.i. at (,) because $f''(x)$ changes from (+/-)ive to (-/+)ive at $x =$ ____."

14. **Sketch** curve.
    (a) Mark any **vertical asymptotes**.
    (b) Draw any **known points**.
    (c) Lightly sketch **end behavior**, if known.
    (d) Lightly sketch a field of **sloped** line segments.
    (e) Lightly sketch a field of **curved** segments locally consistent with the field of slopes.
    (f) **Trace** a curve that
        i. Passes through the known points
        ii. Mimics every sketched arc segment through which it passes