

## Curve Sketching

1. Domain.
2. Intercepts.
  - (a)  $x$ -intercepts: set  $y = 0$ .
  - (b)  $y$ -intercepts: set  $x = 0$ .
3. Asymptotes
  - (a) Vertical: set denominator = 0.
  - (b) Horizontal: polynomial division.
4. Extrema
  - (a) Take derivative.
  - (b) Set derivative equal to zero to get critical points.
  - (c) Use an interval test with  $f'(x)$ , or use a second derivative test, to classify critical points as maxima or minima.
5. Concavity
  - (a) Take the second derivative.
  - (b) Set the second derivative equal to zero.
  - (c) Do an interval test using  $f''(x)$ , to find where  $f''(x)$  is positive and where it is negative.
  - (d) Remember the faces!
6. Points of Inflection

If  $f''(x)$  changes sign at a point  $c$  where  $f''(c) = 0$ , you have a point of inflection.

## Finding Absolute Extrema

1. On a Closed Interval  $[a, b]$ .
  - (a) Find local extrema.
  - (b) Find values of  $f$  at local extrema, at  $a$ , and at  $b$ .
  - (c) Choose the largest or smallest of these values.
2. Of a Function  $f$  (For Optimization).
  - (a) Find the domain of  $f$ .
  - (b) Find all local extrema.
  - (c) Find the value of  $f$  at local extrema, and at the endpoints of its domain (including  $\lim_{x \rightarrow \pm\infty} f(x)$  if the domain includes  $\pm\infty$ .)
  - (d) Choose the largest or smallest of these values.