18.01, September 25, 2003 Curve Sketching

2 B-1, 2 B-2, 2 B-4, 2 B-5

1. Increasing/decreasing: If $f'(x_o) \begin{cases} >0 \\ <0 \end{cases}$ then $f \begin{cases} \text{increasing} \\ \text{decreasing} \end{cases}$ on an interval that contains x_o.

2.Lock max/min where f goes from being increasing to decreasing/decreasing to increasing. If f' defined on (α,b) and $x_0 \in (a,b)$, local max/min then $f'(x_0)=0$, i.e., x_o critical point.

3. When looking for max's/min's find critical points and <u>check</u> endpts, pts where f not cts and where f' not defined.

4. Concave up: serant line lies above graph, concave down: serant line lies below graph.

5. If f''>0 on (α,b) then concave up (etc.). But also $f(x)=x^4$ is concave up even though $f''(\theta)=0$.

6. 2nd derivative rule: $f'(x_0)=0$ and f concave up $\Rightarrow x_0$ a local min.
$f'(x_0)=0$ and f concave down $\Rightarrow x_0$ a local max.

7. Inflection points : Where f changes from concave up to concave down (etc.). If f'' defined on (α,b) and x_o an infl. pt., then $f''(x_0)=0$.

8. Assymptotes and limiting behavior at ∞.

9. Algorithm for curve sketching (just do the above methodically).

10. Sketched $y=\dfrac{x^2}{x-1}$