

# Math 21A

## Kouba

### Graphing Using First and Second Derivatives

1. If  $f'$  is +, then  $f$  is increasing ( $\uparrow$ ).
2. If  $f'$  is -, then  $f$  is decreasing ( $\downarrow$ ).
3. If  $f''$  is + (means  $f'$  is  $\uparrow$ ), then  $f$  is concave up ( $\cup$ ).
4. If  $f''$  is - (means  $f'$  is  $\downarrow$ ), then  $f$  is concave down ( $\cap$ ).

$\begin{array}{c} + \quad 0 \quad - \\ \hline x=a \\ \underbrace{\hspace{2cm}} \end{array} f'$   
relative (or absolute)  
maximum

$\begin{array}{c} - \quad 0 \quad + \\ \hline x=a \\ \underbrace{\hspace{2cm}} \end{array} f'$   
relative (or absolute)  
minimum

$\begin{array}{c} + \quad 0 \quad - \\ \hline x=a \\ \underbrace{\hspace{2cm}} \end{array} f''$   
inflection point

$\begin{array}{c} - \quad 0 \quad + \\ \hline x=a \\ \underbrace{\hspace{2cm}} \end{array} f''$   
inflection point

