## Section 3.1 (Extrema on an Interval)

Examine the graphs below and locate the extrema (maxima and minima) on the given intervals...


Intervals:
$[-2,5],(-2,5),(-1,2),[-1,2]$
What are the derivatives at these extrema?
A relative or local maximum (minimum) at ( $\mathrm{c}, \mathrm{f}(\mathrm{c})$ ) means there is an open interval containing c (not an endpoint) on which $f(c)$ is a maximum. How is a relative maximum different that an absolute minimum?

Let f be a function defined at c . If $\mathrm{f}^{`}(\mathrm{c})=0$ or if f is not differentiable at c , then c is a critical number of f
Finding extrema of a continuous function $f$ on closed interval $[a, b]$...

1. Find the critical numbers on $(a, b)$
2. Evaluate $f$ at each critical number on $(a, b)$ and at endpoints $a$ and $b$
3. The least is the minimum on the interval, the greatest is the maximum

Example: Find the extrema of $y=x^{3}-4 x^{2}$ on the interval $[-2,5]$

Example: Find the extrema of $f(x)=2 x-3 x^{2 / 3}$ on the interval $[-1,3]$

Example: Find the extrema of $f(x)=2 \cos (x)+\cos (2 x)$ on the interval $[0,2 \pi]$

