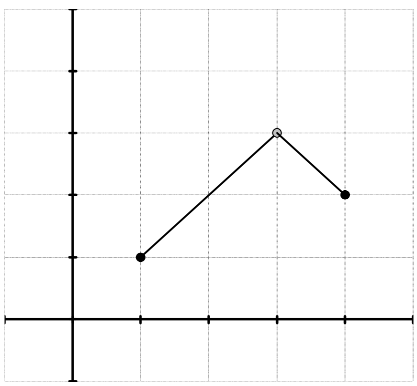
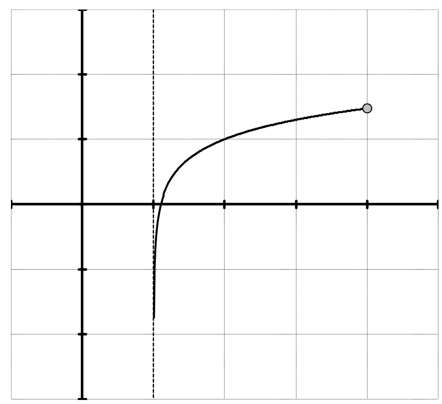
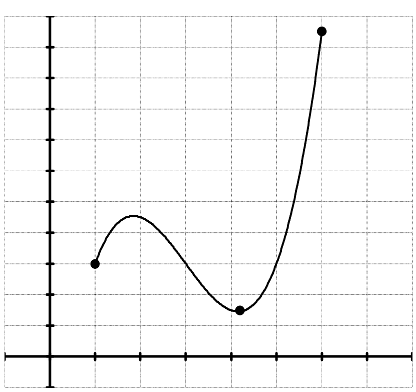
4.2 Extreme Values

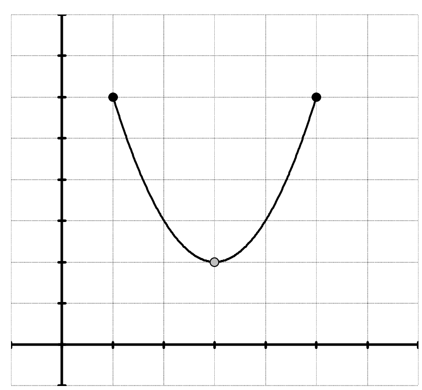
Extreme Values on an Interval: Let $f(x)$ be a function on an interval, let "a" be on the interval

Absoulte Minimum on $f(x)$ is $f(a)$ if $f(a) \leq f(x)$ for all x on the interval
Absoulte Maximum on $f(x)$ is $f(a)$ if $f(a) \geq f(x)$ for all x on the interval







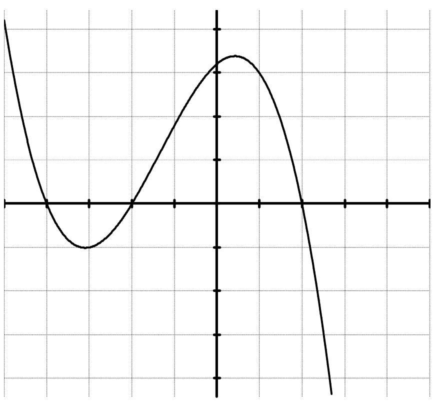


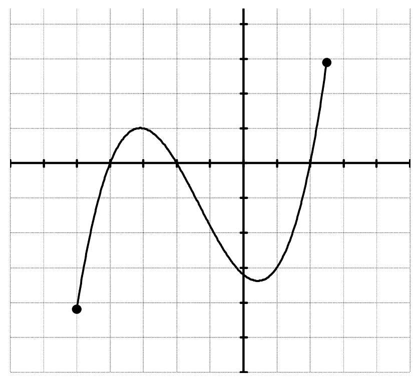
<u>Existence of Extrema:</u> A continuous function *f* on a closed interval [a,b] has both a maximum and a minimum.

<u>Local Extrema: (Relative Extrema)</u>

Local Minimum: at *x=c* if *f(c)* is the minimum on an open interval

Local Maximum: at *x=c* if *f(c)* is the maximum on an open interval





<u>Critical Points:</u>

A number "c" in the domain of f is called a critical point if either:

Local extrema occur at critical points

Absolute extrema occur at endpoints or at critical points.

1. Find the absolute extrema of $f(x) = 3x^4 - 4x^3$ on $[-1,2]$

Value of x	Value of f

2. Find the absolute extrema of $f(x) = 2x - 3x^{\frac{2}{3}}$ on $[-1,3]$

Value of x	Value of f

3. Find the absolute extrema of $f(x) = 2\sin x - \cos 2x$ on $[0,2\pi]$

Value of x	Value of f

Rolle's Theorem:

$f(x)$ is continuous on [a,b] and differentiable on (a,b).

If $f(a) = f(b)$ then there is a number "c" such that $f'(c) = 0$

4. Find all values of c on [-2,2] such that $f'(c) = 0$ $f(x) = x^4 - 2x^2$