

§3.1 is up:  
 Homework  
 video

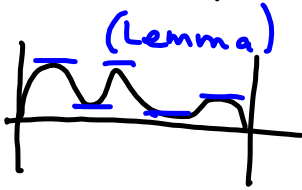
Test 2 Posted

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Rough in §3.2 BY Tuesday

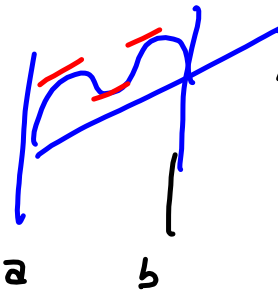
Already Seen MVT

Rolle's Theorem



mentioned in  
 §3.1 video

It's used to prove MVT.



Mean Value  
 Theorem

**1 Definition** Let  $c$  be a number in the domain  $D$  of a function  $f$ . Then  $f(c)$  is the

- **absolute maximum** value of  $f$  on  $D$  if  $f(c) \geq f(x)$  for all  $x$  in  $D$ .
- **absolute minimum** value of  $f$  on  $D$  if  $f(c) \leq f(x)$  for all  $x$  in  $D$ .

**2 Definition** The number  $f(c)$  is a

- **local maximum** value of  $f$  if  $f(c) \geq f(x)$  when  $x$  is near  $c$ .
- **local minimum** value of  $f$  if  $f(c) \leq f(x)$  when  $x$  is near  $c$ .

**3 The Extreme Value Theorem** If  $f$  is continuous on a closed interval  $[a, b]$ , then  $f$  attains an absolute maximum value  $f(c)$  and an absolute minimum value  $f(d)$  at some numbers  $c$  and  $d$  in  $[a, b]$ .

**4 Fermat's Theorem** If  $f$  has a local maximum or minimum at  $c$ , and if  $f'(c)$  exists, then  $f'(c) = 0$ .

**6 Definition** A **critical number** of a function  $f$  is a number  $c$  in the domain of  $f$  such that either  $f'(c) = 0$  or  $f'(c)$  does not exist.

**7** If  $f$  has a local maximum or minimum at  $c$ , then  $c$  is a critical number of  $f$ .

**The Closed Interval Method** To find the *absolute* maximum and minimum values of a continuous function  $f$  on a closed interval  $[a, b]$ :

1. Find the values of  $f$  at the critical numbers of  $f$  in  $(a, b)$ .
2. Find the values of  $f$  at the endpoints of the interval.
3. The largest of the values from Steps 1 and 2 is the absolute maximum value; the smallest of these values is the absolute minimum value.

Converse

Non-example.

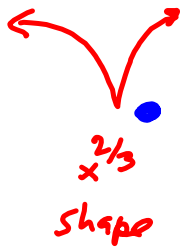
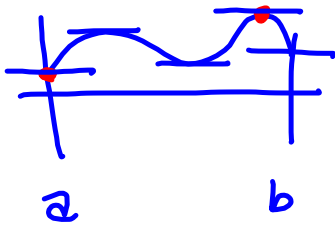
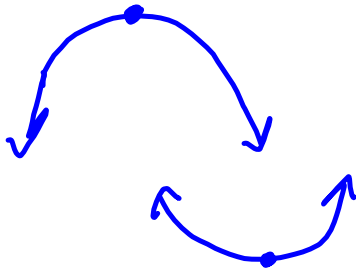
Ternary point.

$$x^3 = y$$

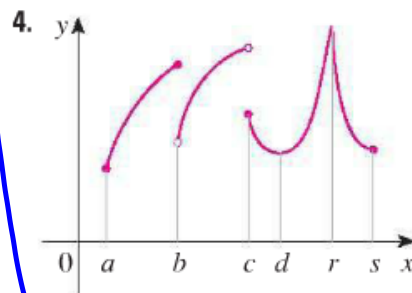
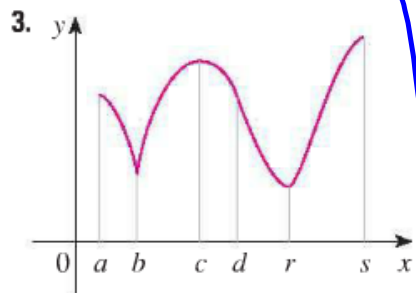
$$y' = 3x^2$$

$$\text{SET} = 0$$

$$x = 0$$

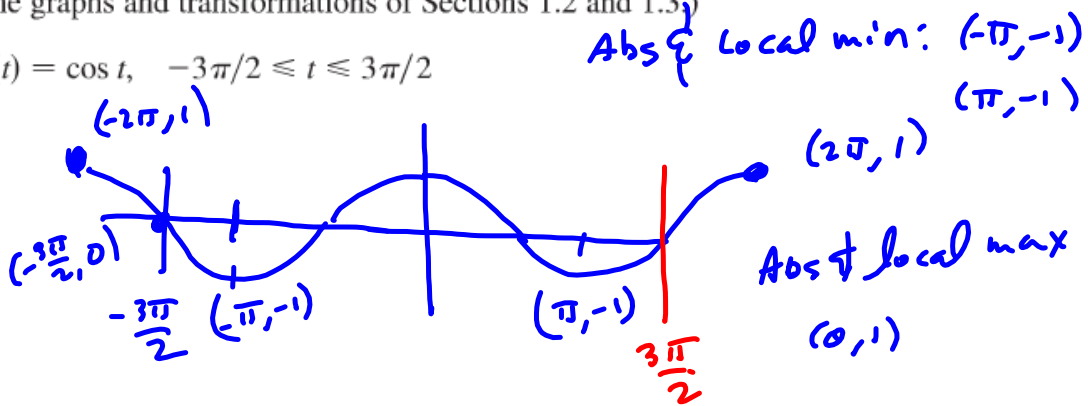


3–4 For each of the numbers  $a$ ,  $b$ ,  $c$ ,  $d$ ,  $r$ , and  $s$ , state whether the function whose graph is shown has an absolute maximum or minimum, a local maximum or minimum, or neither a maximum nor a minimum.



15-28 Sketch the graph of  $f$  by hand and use your sketch to find the absolute and local maximum and minimum values of  $f$ .  
 (Use the graphs and transformations of Sections 1.2 and 1.3.)

22.  $f(t) = \cos t, \quad -3\pi/2 \leq t \leq 3\pi/2$



17.  $f(x) = 1/x, \quad x \geq 1$

