Today's Plan:

Learning Target (standard): I will find the "c" guaranteed by the mean value theorem. I will explain the meaning of this "c."

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make neccessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuarcy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

p.139

$1)AMAX = 5 @ x = -3, 0$

$AMIN = -3 @ x = -2, 1$

$2)AMAX = 20 @ x = -1$

$AMIN = -\frac{4}{3} @ x = \frac{5}{3}$

$3)AMAX = 1 @ x = 0$

$AMIN = -3 @ x = 8$

$4)AMAX = 4 @ x = 0$

$AMIN = -\frac{9}{4} @ x = \frac{\sqrt{10}}{2}$

critical numbers:

$9)x = \frac{3}{8}$

$10)none$

$11)t = -2, \frac{5}{3}$

$12)z = -\frac{7}{3}, \frac{3}{2}$

$13)w = 2$

$14)r = -\frac{\sqrt{5}}{5}, \frac{\sqrt{5}}{5}, -1, 1$

Find the critical numbers.

$$f(x)=\frac{2x}{x-5}$$

$$f'(x)=\frac{2(x-5)-1(2x)}{(x-5)^2}$$

$$=\frac{2x-10-2x}{(x-5)^2}$$

$$f'(x)=\frac{-10}{(x-5)^2}$$

critical #: $x=5$

$$0=\frac{-10}{(x-5)^2}$$

$$0\neq-10$$

$x-5=0$

$x=5$

Find the absolute extremum.

$$f(x)=x^3-x;[-3,3]$$

$f'(x)=3x^2-1$

$0=3x^2-1$

$0=(\sqrt{3}x+1)(\sqrt{3}x-1)$

critical #s: $x=-\frac{\sqrt{3}}{3},\frac{\sqrt{3}}{3}$

$f(-3)=(-3)^3+3$

$=-27+3$

$f(-3)=-24$

$f(3)=(3)^3-3$

$=27-3$

$f(3)=24$

$f(-\frac{\sqrt{3}}{3})=(-\frac{\sqrt{3}}{3})^3+\frac{\sqrt{3}}{3}$

$=-\frac{3\sqrt{3}}{27}+\frac{\sqrt{3}}{3}$

$=-\frac{\sqrt{3}}{9}+\frac{3\sqrt{3}}{9}$

$f(-\frac{\sqrt{3}}{3})=\frac{2\sqrt{3}}{9}$

$f(\frac{\sqrt{3}}{3})=(\frac{\sqrt{3}}{3})^3-\frac{\sqrt{3}}{3}$

$=\frac{\sqrt{3}}{9}-\frac{3\sqrt{3}}{9}$

$f(\frac{\sqrt{3}}{3})=-\frac{2\sqrt{3}}{9}$

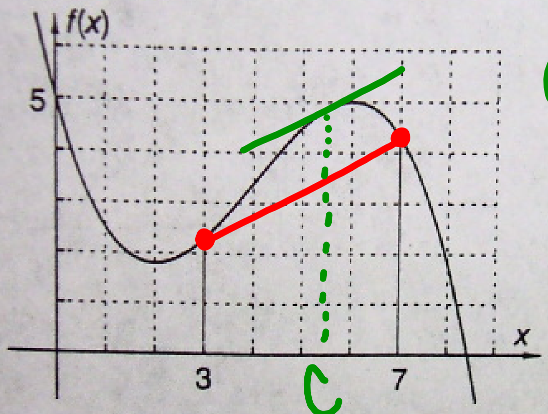
$\therefore$ AMAX $=24$ @ $x=3$

AMIN $=-24$ @ $x=-3$

1. For $f(x) = -0.1x^3 + 1.2x^2 - 3.6x + 5$, graphed below, there is a value of $x = c$ between 3 and 7 at which the tangent to the graph is parallel to the secant line connecting $(3, f(3))$ and $(7, f(7))$. Draw the secant line and the tangent line. Approximately what is the value of c?

one point

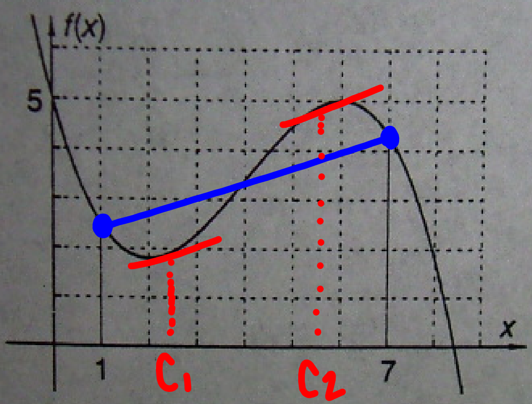
2 points



$c \approx \frac{11}{2}$

2. Function f in Problem 1 has *two* values of $x = c$ between $x = 1$ and $x = 7$ at which the tangent lines are

2. Function f in Problem 1 has *two* values of $x = c$ between $x = 1$ and $x = 7$ at which the tangent lines are parallel to the corresponding secant line. Draw these tangents on the graph below. Approximately what are the values of c?



$c_1 \approx \frac{5}{2}$

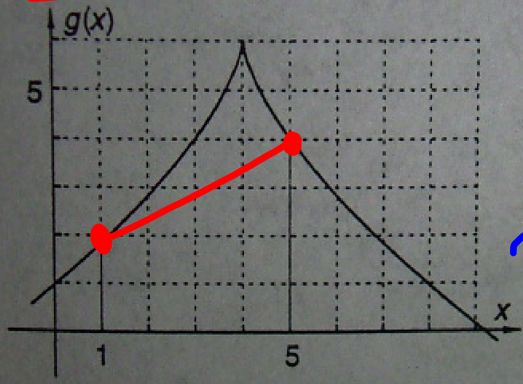
$c_2 \approx \frac{11}{2}$

3. Function $g(x) = 6 - 2(x - 4)^{2/3}$, graphed below, is not differentiable at $x = 4$. Is there a value of $x = c$ between $x = 1$ and $x = 5$ at which the slope of the tangent line equals the slope of the corresponding

3. Function $g(x) = 6 - 2(x-4)^{2/3}$, graphed below, is not differentiable at $x = 4$. Is there a value of $x = c$ between $x = 1$ and $x = 5$ at which the slope of the tangent line equals the slope of the corresponding secant line? If so, draw it. If not, tell why not.

cusp
$f'(4) = \text{und}$

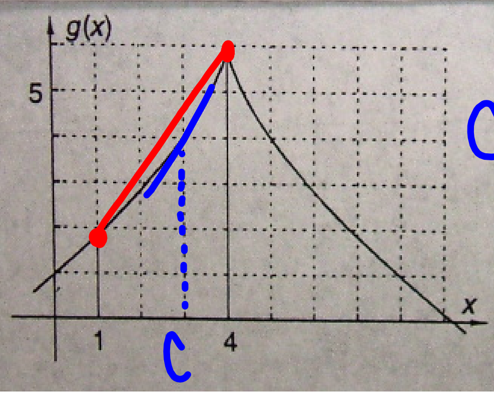
$\boxed{\begin{array}{c} \ell_1 \,//\, \ell_2 \\ m_1 = m_2 \end{array}}$



no tangent line parallel to secant line

4. Function g in Problem 3 *does* have a value of $x = c$ between $x = 1$ and $x = 4$ where the tangent line parallels the corresponding secant line. This is

4. Function g in Problem 3 *does* have a value of $x = c$ between $x = 1$ and $x = 4$ where the tangent line parallels the corresponding secant line. This is true because the point at which the function is not differentiable occurs at the *endpoint* of the interval. Illustrate this fact on the graph in the next column. Approximately what is the value of c?



$c \approx 3$

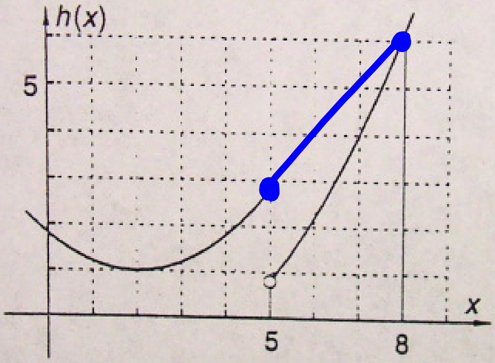
$f'(x) = \text{und}$
not in the interval

5. Function $h(x) = 0.2(x-2)^2 - \frac{|x-5|}{x-5}$ if $x \neq 5$, and $h(5) = 2.8$. Is h differentiable for all x in the *open* interval $(5, 8)$? Is h continuous at $x = 5$? Is there a value of $x = c$ in $(5, 8)$ for which $h'(c)$ equals the slope of the secant line connecting $(5, h(5))$ and $(8, h(8))$? Illustrate your answer.

yes; differentiable on $(5,8)$

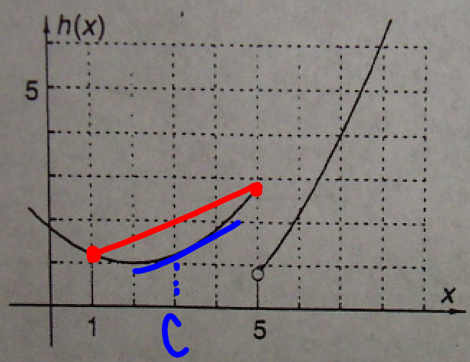
jump discontinuity @ $x=5$

no tangent line



6. Function h in Problem 5 is differentiable on $(1, 5)$ and discontinuous at $x = 5$. Is there a point ...

6. Function h in Problem 5 is differentiable on $(1, 5)$ and discontinuous at $x = 5$. Is there a point $x = c$ in the interval $(1, 5)$ at which $h'(c)$ equals the slope of the corresponding secant line? Illustrate your answer on the graph below.



$c \approx 3$

7. The number $x = c$ in the above problems is the "mean" value referred to the mean value theorem. State the mean value theorem. Explain why the hypotheses are sufficient conditio...

Assignment: Using #5,6, and 7 write a definition of the Mean Value Theorem. Provide three graphical examples to support your claim.

Assignment: "Exercises 3.1" #1-14

- #1-6 identify the location of the AMAX & AMIN
- #7-10 identify the location of ALL extreme values
  - both local and absolute extrema
- #11-14 match the tables to the graphs