For #5 and #6, let f(x) = x^2 - 1 when x < 0 and let f(x) = 2x-1 when x $\geq$ 0.

5) Which of the following is equal to the left-hand derivative of f at x = 0?

a) -2 b) 0 c) 2 d) ∞ e) -∞

6) Which of the following is equal to the right-hand derivative of f at x = 0?

a) -2 b) 0 c) 2 d) ∞ e) -∞

Oct 21-12:56 PM

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

$f(x) = 2x^{1/2}$

Nov 5-10:15 AM

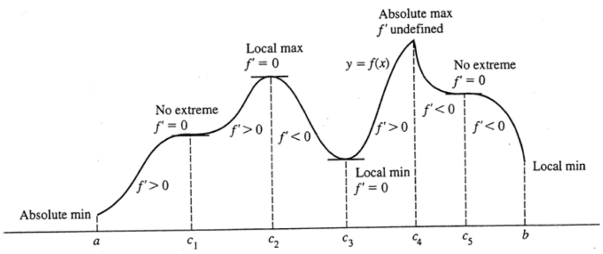
4-3 day 1 The First Derivative Test for Local Extrema

Learning Objectives:

I can use the first derivative test to find local extrema of a function.

I can identify the intervals on which a function is increasing or decreasing.

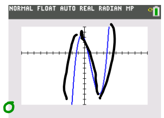
Oct 22-8:29 AM



Oct 22-8:29 AM

Ex1. Find the critical points of each function. Find the functions local extreme values . Identify the intervals on which the function is increasing/decreasing.

1.) $f(x) = 2x^3 - \frac{11}{2}x^2 - 7x + 5$



$f'(x) = 6x^2 - 11x - 7 = 0$

$(3x - 7)(2x + 1) = 0$

$\frac{7}{3}$ $-\frac{1}{2}$

Candidates:
endpoints
derivative is und.
max & min's
$\frac{7}{3}, -\frac{1}{2}$

+ o − o +

-1 $-\frac{1}{2}$ 0 $\frac{7}{3}$ 3

increasing $(-\infty, -\frac{1}{2})$ $(\frac{7}{3}, \infty)$

decreasing $(-\frac{1}{2}, \frac{7}{3})$

$-\frac{1}{2}$ max because f' changes from + to neg.

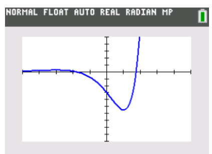
$\frac{7}{3}$ min because f' changes from neg. to +

$(-\frac{1}{2}, \quad)$

$(\frac{7}{3}, \quad)$

Oct 22-8:29 AM

2.) $y = (x^2 - 3)e^x$



$f = x^2 - 3$ $g = e^x$

$f' = 2x$ $g' = e^x$

$y' = e^x(x^2-3) + 2xe^x$

$0 = e^x(x^2-3) + 2xe^x$

$0 = e^x(x^2 - 3 + 2x)$

$0 = e^x(x+3)(x-1)$

no sol. -3 1

Candidates: -3, 1

inc + dec − inc +

-4 -3 0 1 2

-3 = max

1 = min

Oct 22-8:29 AM

3.) $y = x^4 - 2x^3$

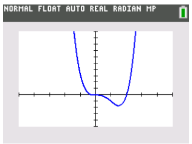
$y' = 4x^3 - 6x^2 = 0$

$2x^2(2x - 3) = 0$

Candidates: $0, \frac{3}{2}$

$-$ $\quad$ $-$ $\quad$ $+$

0 $\quad$ $\frac{3}{2}$



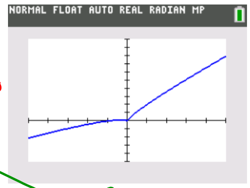
dec: $(-\infty, 3/2)$

inc: $(\frac{3}{2}, \infty)$

min at $x = \frac{3}{2}$

Oct 22-8:29 AM

4.) $g(x) = x^{2/3} + x$



$g'(x) = \frac{2}{3}x^{-1/3} + 1 = 0$

$\frac{2}{3\sqrt[3]{x}} + 1 = 0$

$\frac{2}{3\sqrt[3]{x}} = -1$ $\quad$ $2 = -3\sqrt[3]{x}$

$-\frac{2}{3} = \sqrt[3]{x}$

$-\frac{8}{27} = x$

Candidates:

$0 \rightarrow$ not diff.

$-\frac{8}{27}$

$-$ $\quad$ $+$

$-\frac{8}{27}$ $\quad$ 0

Oct 22-8:29 AM

First Derivave Test for Local Extrema

f′(x)>0 $\quad$ f(x) is increasing

f′(x)<0 $\quad$ f(x) is decreasing

1st derivaves find slope (tell us if the funcon is increasing or decreasing) and are used to find extrema (max's and min's).

A sign change in the first derivave indicates that the funcon has changed from increasing to decreasing or vice versa. You must observe a sign change to be sure that an extrema is present.

Oct 22-8:29 AM

Homework

pg 215 # 1-6, 23, 24

Oct 22-8:29 AM