5.1 B | 5.2 A
Wednesday, October 2, 2019 7:58 AM

Finding Extrema & Inc/Dec Interval

Ex: For $f(x) = 3x^4 + 5$ on $[-2, 3]$,

a. Find all extrema. Justify.

$f'(x) = 12x^3$

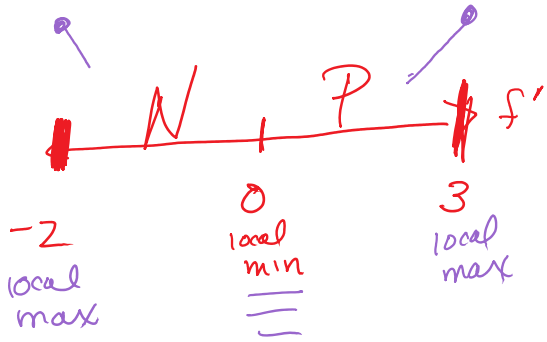
$f' = 0$

$12x^3 = 0$

$x = 0$

$f' = \text{dne}$

never



x	f(x)
-2	53
0	5
3	248

f(x) has a max of 248 @ $x = 3$ b/c $x = 3$ is an endpt and $f' > 0$ to the left of $x = 3$.

f(x) has a local max of 53 @ $x = -2$, b/c $x = -2$ is an endpt and $f' < 0$ to the right of $x = -2$.

f(x) has a min of 5 @ $x = 0$ b/c f' goes from − to + @ $x = 0$.

b. where is f increasing? Justify

f(x) is increasing $[0, 3]$, b/c $f' > 0$ over the interval.

c. where is f decreasing? Justify

f(x) is decreasing $[-2, 0]$, b/c $f' < 0$

over the interval.

ex: given $f(x) = -\frac{2}{3}x^3 + 3x^2 + 5$

a. Find all local/relative extrema. Justify

$$f'(x) = -2x^2 + 6x$$

$f' = 0$

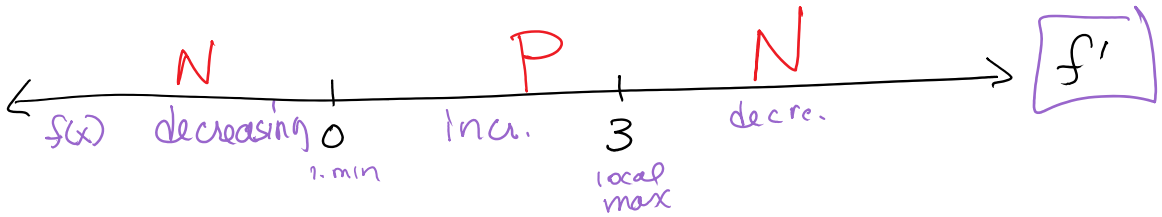
$-2x^2 + 6x = 0$

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

$x = 0 \quad x = 3$

$f' = \text{dne}$

never



f(x) has a local min @ $x=0$, blc f' goes from $-$ to $+$ @ $x=0$.

f(x) has a local max @ $x=3$, blc f' goes from $+$ to $-$ @ $x=3$.

b. When is f(x) inc/dec. Justify.

f(x) is decreasing from $(-\infty, 0] \cup [3, \infty)$, blc f' is negative over the interval.

f(x) is increasing from $[0, 3]$, blc $f' > 0$ over the interval.

Find all critical points of $f(x) = xe^x$

$f' = xe^x + e^x$ $\quad e^x(x+1) = 0$ $\quad x = -1$ c.p