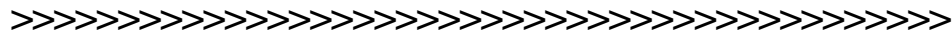


1. Find $f'(x)$ and simplify

a) $f(x) = (x^3 - 2x)(4x - 1)$

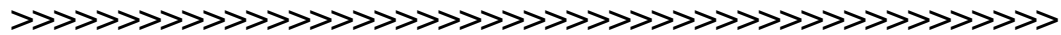
b) $f(x) = \frac{6x^2 - x + 3}{x^3 - 5}$



2. Find $f'(x)$ and do **not** simplify

a) $f(x) = (\sqrt{x} + 3)\left(\frac{4}{x} + 3x^2\right)$

b) $f(x) = \frac{8 - \sqrt[3]{x^2}}{\frac{5}{x} - 2x}$



3. Find $f'(x)$ and the equation of the tangent line at $x = 3$

a) $f(x) = (x + 2)(x^2 - 5)$

b) $f(x) = \frac{3x - 1}{4x + 7}$

3. It is estimated that t years from now, the population of a certain town will

be $p(t) = 20 - \frac{6}{t+1}$ thousands

A study indicates that the average daily level of carbon monoxide in the air

will be $c(p) = 0.5\sqrt{p^2 + p + 58}$ ppm when the population is p thousand

a. At what rate will the carbon monoxide level be changing with respect to population when the population is 18 thousand people?

b. At what rate will the carbon monoxide level be changing with respect to time 2 years from now?

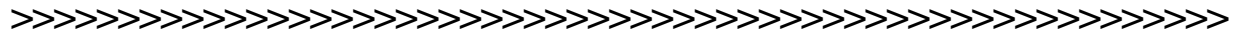
LOCAL EXTREMA AND THE FIRST DERIVATIVE TEST

Finding local (or relative) extrema for a nonconstant function continuous on the interval (a,b)

1. Find the domain of the function
2. Find the **Critical Values**, c , of the function: values of x in the domain of the function that make $f'(c) = 0$ or $f'(c) = ND$

3. Use a sign analysis for f' and label the Critical Values.
The critical values divide the f' x-number line into intervals.
Test a value from each interval into f' to determine if f' is positive or negative throughout that interval.

If the sign of f' changes
from + to -, then $f(c)$ is a local maximum
from - to +, then $f(c)$ is a local minimum
no change at $x=c$ means that there is not a local extremum at c



Use the First Derivative test to determine where $f(x)$ is increasing , decreasing , and local extrema

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

2. $y = -x^3 - 8x^2 + 9x - 6$

Example Find the absolute extrema for $f(x) = 2x^3 - 3x^2 - 12x + 24$

- a. for $[-3,4]$
- b. for $[-2,3]$
- c. for $[-2,1]$

Example: A company manufactures and sell x radios per week. The revenue received for selling x radios per week is modeled by

$$R(x) = 10x - 0.001x^2 \quad \text{for } 0 \leq x \leq 10,000.$$

- a. find the production level that will yield the absolute maximum revenue
- b. Give the absolute maximum revenue