Answer on Question #50807 – Math – Differential Calculus | Equations

y=2x^3-9x^2+12x+5 it has minima at x=2 and maxima at x=1. My question is any other maxima or minima can be found except those point?

Solution

$y = 2x^3 - 9x^2 + 12x + 5.$

Local extrema of differentiable functions can be found by Fermat's theorem, which states that they must occur at critical points. One can distinguish whether a critical point is a local maximum or local minimum by using the first derivative test, second derivative test, or higher-order derivative test, given sufficient differentiability.

According to a Definition of a Critical Number:

if

1) $y(x)$ is not differentiable at c, or

2) $y'(x) = 0$,

then c is a critical number of $y(x)$.

1) Function $y(x) = 2x^3 - 9x^2 + 12x + 5$ is differentiable on the entire real line ($(-\infty, +\infty)$).

2) $y'(x) = 6x^2 - 18x + 12$.

Set $y'(x)$ equal to 0:

$y' = 6x^2 - 18x + 12 = 0 \Rightarrow x^2 - 3x + 2 = 0 \Rightarrow x_1 = 1, x_2 = 2$ are critical numbers.

Using the Second Derivative Test, let's find the relative extrema for $y(x) = 2x^3 - 9x^2 + 12x + 5$.

Using $y'' = 12x - 18 = 6(2x - 3)$ we can apply the Second Derivative Tests:

Point	(*c; y(c)*)= $(1;10)$	(*c;y(c)*)= $(2;9)$
Sign of $y''(x)$	$y''(1) = -6 < 0$	$y''(2) = 6 > 0$
Conclusion	Relative maximum of the function	Relative minimum of the function

So, there are no other maxima or minima points except the above indicated ones.