

4.9 Second Derivative and Applications

$f''(x)$ is the second derivative of $f(x)$ and the derivative of $f'(x)$.

The second derivative describes how the slopes of the tangents are changing with respect to x .

Ex 1 Let $s(t)$ describe your position and $s(0)=0$. What does each describe?

(a) $s(t) < 0$ (b) $s'(t)$ (c) $s''(t)$ (d) $s(t) > 0, s'(t) > 0$ (e) $s'(t) > 0, s''(t) < 0$

So since $s(t)$ is displacement, $s'(t) = v(t)$ is velocity and $s''(t) = a(t)$ is acceleration.

Ex 2 What do you know about an object if $s(t)v(t) > 0, s(t)v(t) < 0$?

Ex 3 What do you know about an object if $v(t)a(t) > 0, v(t)a(t) < 0$?

Ex 4

Find $f''(x)$ given that $f(x) = x \cos x + \frac{1}{x}$.

Ex 5 What does $f''(x) > 0$ tell you about $f(x)$?

Ex 6 Discuss absolute extrema for the curve $f(x) = \frac{1}{2}x + \sin x$ $[0, 2\pi]$

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