WORKSHEET 11

MATH 101

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Approximations

Question 1. *From the video of 3Blue1Brown, summarize what is Taylor series? A reference for Taylor series is here:* https://tutorial.math.lamar.edu/classes/calcii/taylorseries.aspx

Another reference to learn about why infinite series is fun by one of the finest mathematicians in this generation, Charles Fefferman (Princeton University): https://www.youtube.com/watch?v=Jwtn5_d2YCs

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Question 2. *Find the Taylor series for the following functions:*

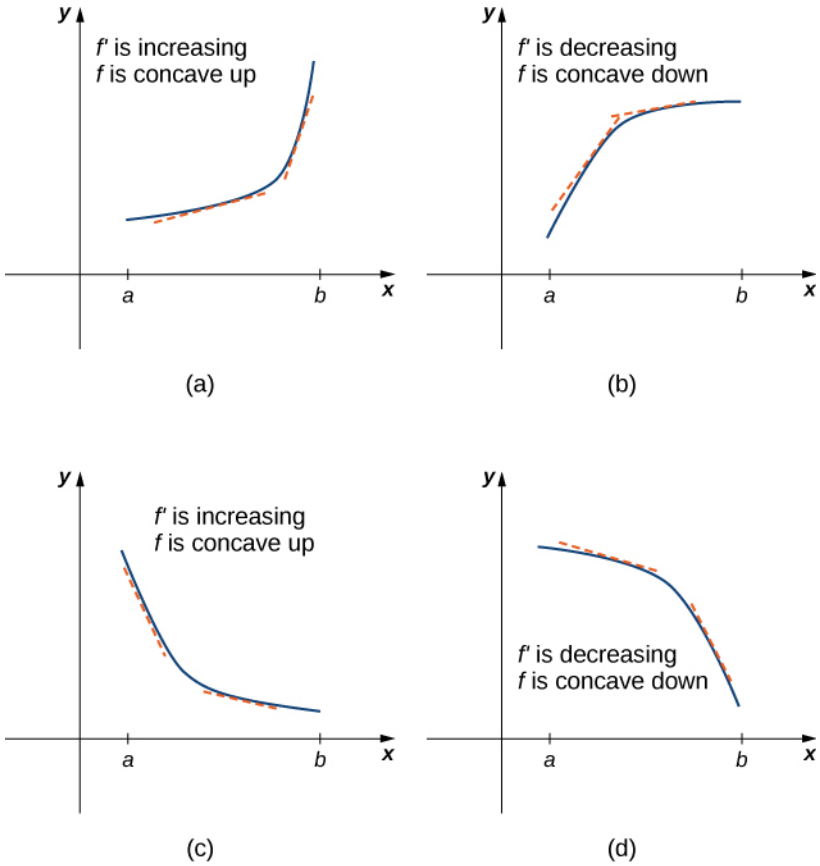
(1) $\sin(x)$

(2) e^x

(3) $\ln(1+x)$

Optimization

The meaning of second derivative is that it tells us about the concavity of the graph of a function.



Definition 1. Let f be a function defined over an interval I and let $c \in I$. We say f has an absolute maximum on I at c if $f(c) \geqslant f(x)$ for all $x \in I$. We say f has an absolute minimum on I at c if $f(c) \leqslant f(x)$ for all $x \in I$. If f has an absolute maximum on I at c or an absolute minimum on I at c, we say f has an absolute extremum on I at c.

Theorem 1. *If f is a continuous function over the closed, bounded interval $[a, b]$, then there is a point in $[a, b]$ at which f has an absolute maximum over $[a, b]$, and there is a point in $[a, b]$ at which f has an absolute minimum over $[a, b]$.*