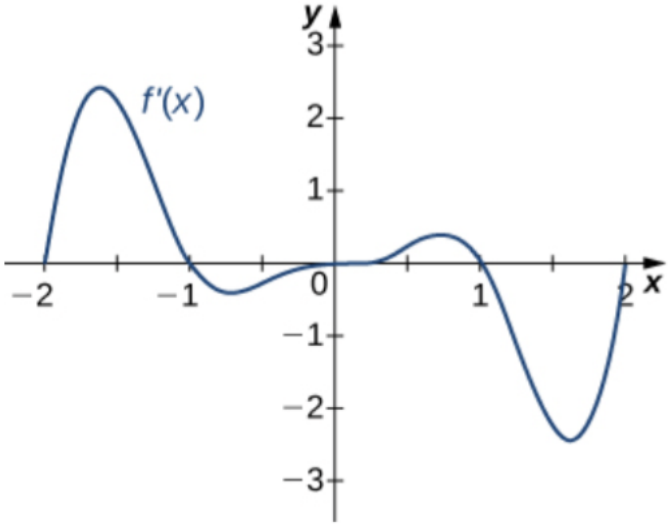
For questions: at52@rice.edu March 6

IN-CLASS ACTIVITY : MEAN VALUE THEOREM

1. Below is the graph of the derivative $f'(x)$ of a function $f(x)$.



i) Find the intervals where the function $f(x)$ is increasing.
ii) Find the intervals where the function $f(x)$ is concave up.
iii) Indicate all points where the tangent line to the graph of $f(x)$ is horizontal.

2. Compute the derivative of the following functions :

i) $f(x) = \frac{\ln(1+x^2)}{x+1}$
ii) $f(x) = \sqrt{\frac{\ln(x+1)}{x}}$
iii) $f(x) = \ln(\ln(x))$
iv) $f(x) = \sqrt{\arctan(x)}$
v) $f(x) = \frac{\sin(e^{-x})}{x}$
vi) $f(x) = \log_2(x \arctan(x))$

3. Consider the function $f(x) = \left|x - \frac{1}{2}\right|$ defined in the interval $[-1, 1]$.
i) Draw the graph of $f(x)$.
ii) Is $f(x)$ continuous at every point ?
iii) Is $f(x)$ differentiable at every point ?
iv) Compute the derivative of $f(x)$ (when differentiable) and draw its graph.
v) Is there a point $c \in [-1.1]$ such that $f'(c) = \frac{f(1)-f(-1)}{2}$? How does it fit with the mean value theorem ?

4. Use everything we have seen so far to sketch the graph of the function $f(x) = \frac{e^x}{x+1}$. In particular,

i) Indicate where the function is well-defined, continous and differentiable.

ii) Compute the limits $\lim_{x \to -1^+} f(x)$ and $\lim_{x \to -1^+} f(x)$.

iii) Compute the derivative of $f(x)$ and find the intervals where the function is increasing.