MATH 100 – WORKSHEET 18
THE MVT AND CURVE SKETCHING

1. The Mean Value Theorem

Theorem. *Let f be defined and differentiable on $[a, b]$. Then there is c between a, b such that $\frac{f(b)-f(a)}{b-a} = f'(c)$. Equivalently, for any x there is c between a, x so that $f(x) = f(a) + f'(c)(x - a)$.*

(1) Suppose $f(1) = 3$ and $-3 \leq f'(x) \leq 2$ for $x \in [1, 4]$. What can you say about $f(4)$?

(2) Suppose $f'(x) = \frac{e^x}{x+\pi}$ for $0 \leq x \leq 2$. How large can $f(2) - f(0)$ be?

(3) Suppose $f'(x) > 0$ for all $x \in (a, b)$. Show that $\frac{f(b)-f(a)}{b-a} > 0$, and hence that $f(b) > f(a)$.

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(4) Show that $|\sin a - \sin b| \leq |a - b|$ for all a, b.