MATH 2413 Fall 2012, Lectures 23-25

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Outline of Sections 3.10–4.1

1. Linear approximation; linearization; Tangent line at a given point;
2. Error of approximation;
3. Differentials: $\mathrm{d}y = f'(x)\mathrm{d}x$ if $y = f(x)$ is differentiable.
4. Definitions of absolute maximum/minimum; local maximum/minimum;
5. Extreme value theorem: If f is continuous in a closed interval $[a, b]$, then f has abs. max and min.
6. Fermat's Theorem: If f has a local max / min at c and $f'(c)$ exists, then $f'(c) = 0$;
7. Critical number; Another version of Fermat's Theorem;
8. The closed interval method for abs max / min in a closed interval $[a, b]$.

Exercises:

1. Show that for every $a > 0$ the linear approximation $L(x)$ of $f(x) = \sqrt{x}$ at $x = a$ satisfies $f(x) \leq L(x)$ for every $x > 0$.
2. Consider $f(x) = \frac{\sin x}{x}$ on $[0, n\pi]$, $n \in \mathbb{N}$. How many local maxima/minima does f have?