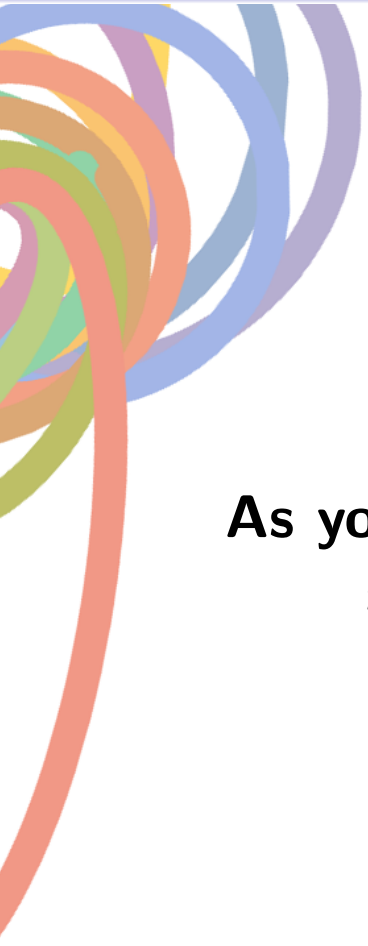
Welcome to MAT135 LEC0101 (Assaf)



As you walk in, write down on the top of your notebook something that made you happy this weekend.

S3.4 – Nothing to Lose but our Chains

Assaf Bar-Natan

" You will never love me again
I can still hear you saying
You would never break the chain (Never break the chain) "

–" The Chain ", Feetwood Mac

Oct. 21, 2019

Notation

Write down the chain rule using Leibniz notation (ie, with $\frac{d}{dx}$'s), and using Newton's notation (ie, with $'$s). Which one do you prefer?

Interpreting Leibniz, Part 2

In a manuscript dated Nov. 1676, Leibniz wrote:

ordinates changes according to some determined law. It will be worth while especially to apply the method to irrationals and compound fractions.[64]

$$\overline{d\sqrt[2]{a+bz+cz^2}}.$$ Let $a+bz+cz^2=x$;

then $$\overline{d\sqrt[2]{x}}=-\frac{1}{2\sqrt{x}},$$ and $$\frac{dx}{dz}=b+2cz;$$

therefore $$\overline{d\sqrt[2]{a+bz+cz^2}}=-\frac{b+2cz}{2\,\overline{dz}\,\sqrt{a+bz+cz^2}}$$

Taking any equation between two letters x and y for a curve, and determining the equation of the tangent, either of the two letters x or y can be eliminated, so that all that remains is the other together with $\overline{dx}$ and $\overline{dy}$; and this will be worth while doing in all cases to facilitate the calculation.

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Using the Chain Rule

Consider the function

$$f(x) = e^{5x \sin(x)}$$

Write down the differentiation rules you would need to use in order to find $\frac{d}{dx} f(x)$. Apply these rules to find $f'(x)$.

One-Minute Essay

In his manuscript, Leibniz wants to find $\frac{d}{dz}\sqrt{a+bz+cz^2}$. Writing $y=\sqrt{z+bz+cz^2}$, he examines $\frac{dy}{dx}\frac{dx}{dz}$. Cancelling out the dx's, gives:

$$\frac{dy}{dz}=\frac{dy}{dx}\frac{dx}{dz}$$

In your experience with calculus, is this a valid manipulation to compute derivatives? Explain.

Plans for the Future

For Wednesday:

WeBWork 3.5 and read section 3.5