Dec. 4

Grab a Survey →

Final Exam: Dec. 14 (Monday)
at 12 noon in LSK 201
2.5 hours.

Regular office hours Today: (1-3pm)

Exam office hours: (in LSK 3000)

Thurs. (10th) 2-4pm
Fri. (11th) 12-3pm
(Ian 2-3)
Sat. (12th) 1-3pm
(Ian 2-3)

- Course Evaluations; do them.
- Solutions to HW11 posted.
- All assignments/quizzes returned.
- All grades posted - no names?
  - term grade posted today.
- Exam practice posted today.

- Review: — unit circle, trig.
  — e^x, $\ln x$
  — $x^2 x^3 = x^5$.

Topics:
- Limits
- asymptotes
- Definition of Derivative

} not on exam.

- ~~Def~~ Derivative Rules.

power / product / quotient / chain — tangent line computations.

Eg. $\left(x e^{\sin x}\right)'$.

$= (x)' e^{\sin x} + x\left(e^{\sin x}\right)'$

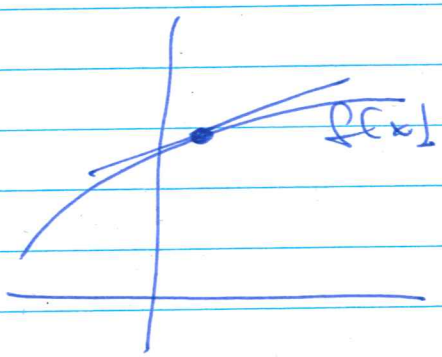
$= e^{\sin x} + x e^{\sin x} \cdot \cos x$.

- Related Rates.
- Riemann Sums.
- Definite / Indefinite Integrals.
- Substitution
- Integration by Parts.
- "Word problem".

- Expect a "Synthesis" question where you are asked to draw a function.

Where does math go / what do I do all day?

Differential Calc.

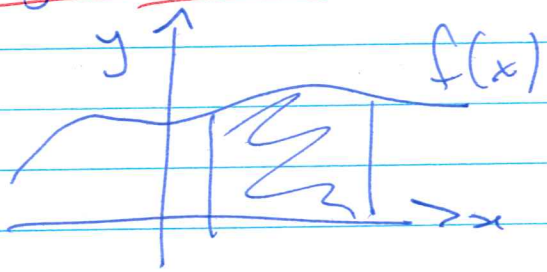


Find tangent line.

- Needed derivatives

$$\frac{df}{dx}.$$

Integral Calc.

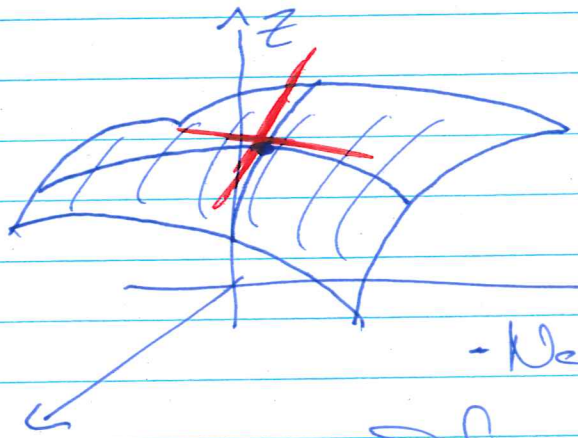


Find area.

- Needed integral

$$\int f(x)dx.$$

Multi-variable Calculus:



$f(x,y)$.

Can have tangent lines in multiple directions.

- Need Partial derivatives.

$$\frac{\partial f}{\partial x}, \quad \frac{\partial f}{\partial y}.$$

Differential Equations:

Eg.: • $f'(x) = f(x)$.

Find $f(x)$ satisfying the equation.

$f(x) = e^x$.

• $f''(x) = -f(x)$.

$f(x) = \pm\cos x$ or $\pm\sin x$.

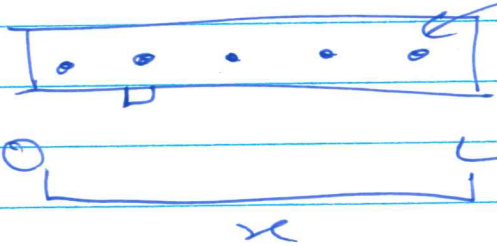
• $f''(x) - 5f'(x) + 6f(x) = 0$.

$f(x) = e^{3x}$ or e^{2x}.

Partial Differential Equations:

(this is what I do).

Eg. heat in a rod.



$u(x,t)$. Heat Eq. $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$.

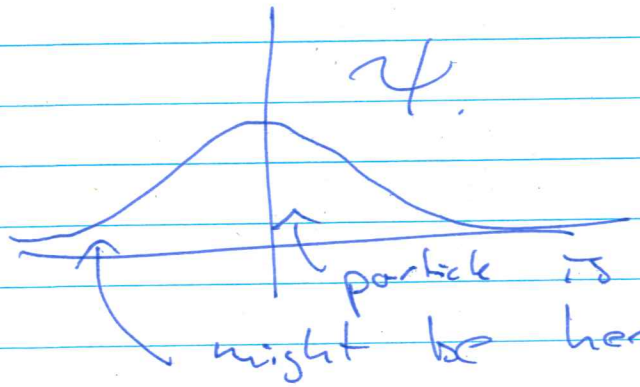
(5)

I study the Nonlinear Schrödinger Equation.

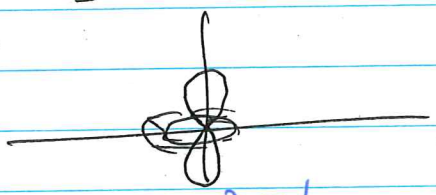
Linear: $i\frac{\partial \psi}{\partial t} = -\frac{\partial^2 \psi}{\partial x^2} + V\psi$

V external force

$i = \sqrt{-1}$.



- analysis of this gives the orbital shapes

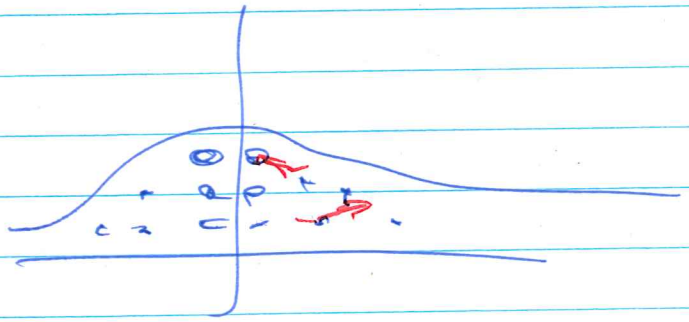


Nonlinear: $i\frac{\partial \psi}{\partial t} = -\frac{\partial^2 \psi}{\partial x^2} \pm |\psi|^2 \psi$.

$+$ is particles don't like each other

$-$ particles do.

Many particles



What is happening.