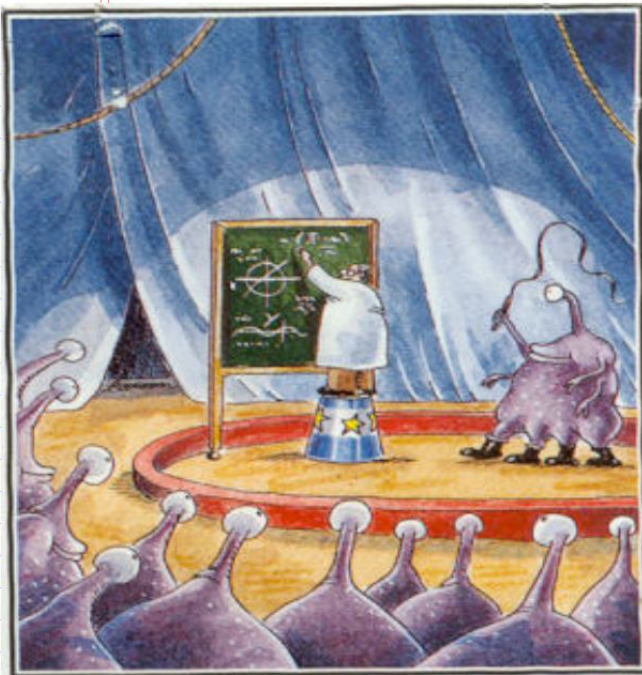


Panel 1



Abducted by an alien circus company, Professor Doyle is forced to write calculus equations in center ring.

Math 2511

Calculus 3

Welcome!

Bert  
Wechsman

Panel 2

About this course:

<http://pirate.shu.edu/~wachsman/>

Dyknow: Server:

dyknows://secure.dyknow.com/shu.edu

user: 9-letter

pass: 9-letter

Maple, Wolfram Alpha

Panel 3

Calc I - Overview			
	Def.	Geometry	How-to
Limit	Given $\epsilon > 0$ there is $\delta > 0$ such that: if $ x-c  < \delta$ $\Rightarrow  f(x)-L  < \epsilon$	if $x$ gets close to $c$ , then $f(x)$ gets close to $L$	plug in, look for the limit l'Hopital's Rule
Continuity	$\lim_{x \rightarrow c} f(x) = f(c)$	graph has no holes, gaps	graph it
Differentiation	$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$	slope of tangent	power, product, quotient, chain.
Integration	$\int_a^b f(x) dx$ $\lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \Delta x_i$	area under curve ( $f > 0$ ), else net area	antideriv, fund. thm of calc

Panel 4

Calc I: Some Refreshers

$\lim_{x \rightarrow 0} \frac{2x \sin(x) + x^2 \cos(x) + \sin(x)}{1 - \cos(x)}$

①  $\lim_{x \rightarrow 1} \frac{x^2-1}{x} = 0$ ,  $\lim_{x \rightarrow 2} \frac{x^2-4}{x-2} = \lim_{x \rightarrow 2} \frac{2x}{1} = 4$ ,  $\lim_{x \rightarrow 0} \frac{x^2 \sin(x)}{1 - \cos(x)} = ?$  (L'H)

②  $f(x) = x^2 - \sin(x) + e^x - \sqrt{x} + \ln(x)$   
 $f'(x) = 2x - \cos(x) + e^x - \frac{1}{2}x^{-1/2} + \frac{1}{x}$

$g(x) = \frac{x \sin(x)}{\sqrt{1-x^2}}$ ,  $g'(x) = \frac{(\sin(x) + x \cos(x)) \sqrt{1-x^2} - x \sin(x) \left( \frac{-2x}{2\sqrt{1-x^2}} \right)}{(1-x^2)^2}$

③  $\int (5x - 3\sqrt{x} + e^x - \frac{5}{x} - \frac{6}{x^2}) dx = \frac{5}{2}x^2 - \frac{3}{3/2}x^{3/2} + e^x - 5 \cdot \ln|x| + \frac{6}{x} + C$

Panel 5

Calc 2 - Overview

- Heavy Duty Integration Techniques

eg.: u-subst., int parts, pfd

- Applications of Integration

eg.: 3D volumes

- Sequences & Series

eg.:  $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \dots = \sum_{n=0}^{\infty} \left(\frac{1}{2}\right)^n = \frac{1}{1-\frac{1}{2}} = 2$

geometric series

- Differential Equations

eg.  $y' = ky$        $y = e^{kx}$   
 $y' = ke^{kx} = ky$

Panel 6

Calc 2 Refresher

$x = g$   
 $f(h(x)) = f'$

①  $\int x \cdot \sin(x) dx = -x \cos(x) + \int \cos(x) dx = \checkmark$

~~$\int \frac{d}{dx} (f \cdot g) = f'g + f \cdot g'$~~   $\rightarrow \int (f'g) = fg - \int (fg')$

②  $\int \frac{5x}{x^2-x-2} dx$        $A(x+1) + B(x-2) = 5x$   
 $x=2, 3A=10 \rightarrow A=10/3, x=-1, -3B=5 \rightarrow B=5/3$

$\frac{5x}{x^2-x-2} = \frac{5x}{(x-2)(x+1)} = \frac{A}{x-2} + \frac{B}{x+1} = \frac{A(x+1) + B(x-2)}{(x-2)(x+1)}$        $B = \frac{5}{3}$

$\int \frac{5x}{x^2-x-2} dx = \int \frac{10/3}{x-2} + \frac{5/3}{x+1} dx = \frac{10}{3} \cdot \ln|x-2| + \frac{5}{3} \ln|x+1| + C$

Panel 7

Calc 3, Int. and Diff. of functions  
with several variables !!

$$f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = x^2$$

$$f: \mathbb{R} \rightarrow \mathbb{R}^2, f(t) = (\cos(t), \sin(t))$$

$$f: \mathbb{R} \rightarrow \mathbb{R}^3, f(t) = (\cos(t), \sin(t), t^2)$$

$$f: \mathbb{R}^2 \rightarrow \mathbb{R}, f(x, y) = x^2 + 5xy$$

$$f: \mathbb{R}^3 \rightarrow \mathbb{R}, f(x, y, z) = xyz$$

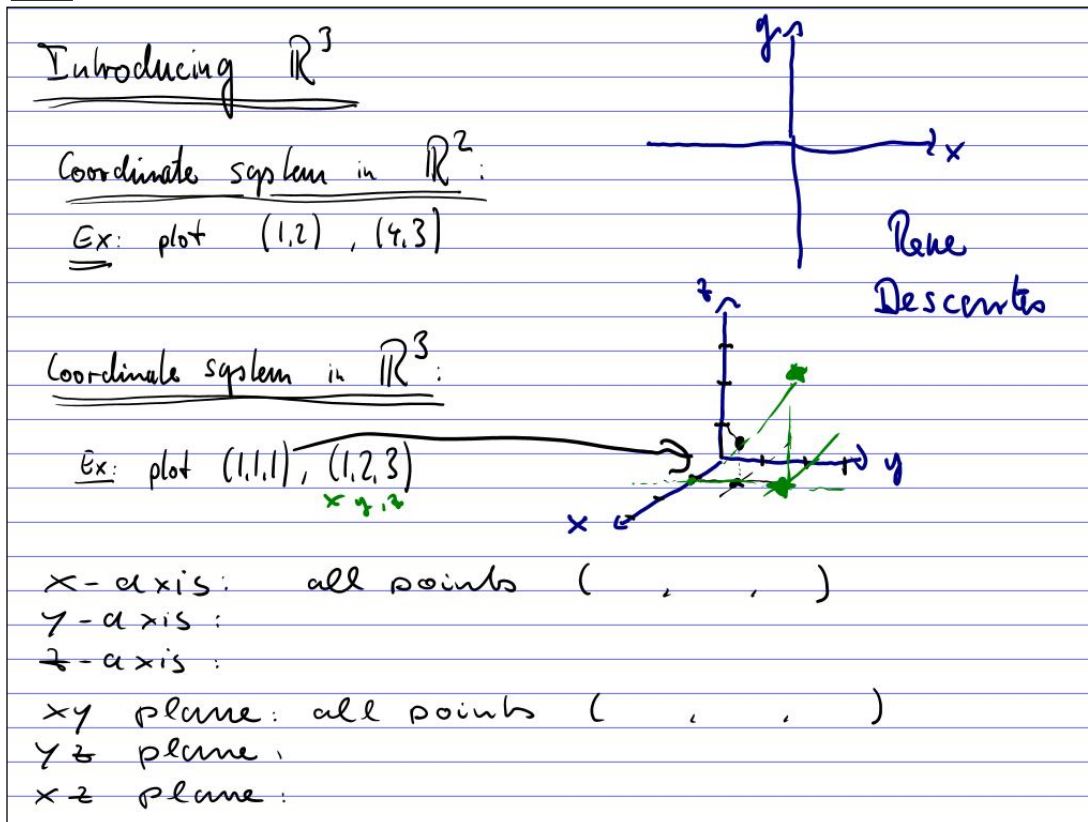
$$f: \mathbb{R}^2 \rightarrow \mathbb{R}^3, f(x, y) = \left( xy, x^2 + y^2, \frac{x}{1+y^2} \right)$$

Panel 8

$$f: \mathbb{R} \rightarrow \mathbb{R}$$

$$f: \mathbb{R} \rightarrow \mathbb{R}^2$$

Panel 9



Panel 10

