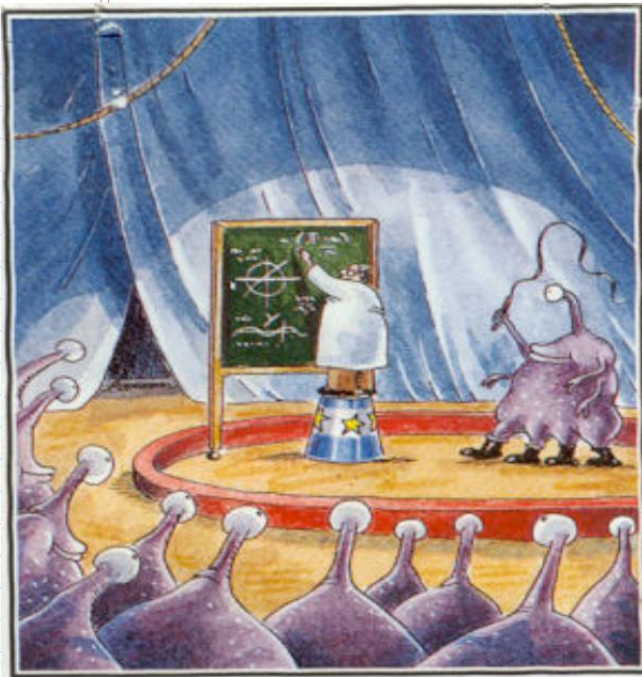


Panel 1



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

Math 2511

Calculus 3

Welcome!

Wachsunt

Panel 2

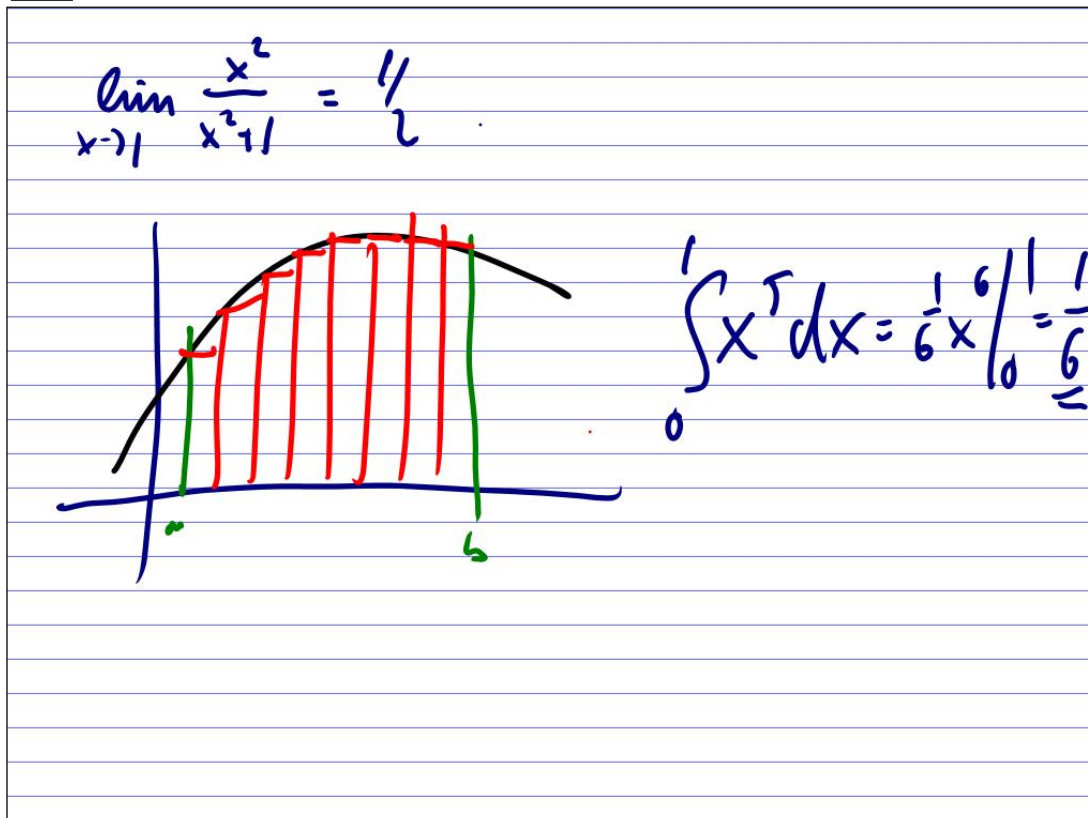
About this course:

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

Panel 3

Calc I - Overview			
	Def.	Geometry	How-to
• Limit	✓	✓	✓
• Continuity	$\lim_{x \rightarrow a} f(x) = f(a)$	graph has no gaps, holes	how to find limits
• Differentiation	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$	slope of tangent	product, quotient, chain
• Integration	$\int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \Delta x$ Riemann Sums	area under f if $f > 0$	<u>antiderivatives!</u>

Panel 4



Panel 5

Calc 1 : Some Refresher

① $\lim_{x \rightarrow 1} \frac{x^2-1}{x} = 0$ $\lim_{x \rightarrow 2} \frac{x^2-4}{x-2} = 4$ $\lim_{x \rightarrow 0} \frac{x^2 \sin(x)}{1-\cos(x)} =$

② $f(x) = x^2 - \sin(x) + e^x - \sqrt{x} + \ln(x)$ $\lim_{x \rightarrow 0} \frac{2x \sin(x) + x^2 \cos(x) + \sin(x)}{1-\cos(x)}$

$f'(x) = 2x - \cos(x) + e^x + \frac{1}{2}x^{-1/2} + \frac{1}{x} = \lim_{x \rightarrow 0} \frac{x^2 \cos(x)}{\sin(x)}$

HW $g(x) = \frac{x \sin(x)}{\sqrt{1-x^2}}$ $x^{1/2} \cdot x^{-1} = \lim_{x \rightarrow 0} \frac{2x \cos(x) - x^2 \sin(x)}{\cos(x)} = 0$

③ $\int 5x - 3\sqrt{x} + e^x - \frac{5}{x} - \frac{6}{x^2} dx =$

$5 \frac{1}{2} x^2 - \int \frac{3}{2} x^{1/2} + e^x - 5 \ln|x| + 6 x^{-1} + C$

Panel 6

Calc 2 - Overview

- Heavy Duty Integration Techniques
eg: int. parts, p/d
- Applications of Integration
eg: rotational solids, inertia
- Sequences & Series
eg: Taylor, Geometric series, conv. + div.
- Differential Equations
eg: $y' = 5y$

Panel 7

Calc 2 Refresher

$$\textcircled{1} \int x \sin(x) dx = -x \cos(x) + \int \cos(x) dx =$$

int. part.

$$u = x \quad \swarrow \quad \searrow$$

$$v' = \sin(x)$$

$$u' = 1 \quad \nearrow \quad \searrow$$

$$v = -\cos(x)$$

$$= -x \cos(x) + \sin(x) + C$$

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

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

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

$$\textcircled{3} \left(\frac{5x}{1+x^2} \text{ as a power series} \right)$$

$$x=2: 3A=10 \Rightarrow A=\frac{10}{3}$$

$$x=-1: -3B=-5 \Rightarrow B=\frac{5}{3}$$

skip

Panel 8

Calc 3: Calc 1 + Calc 2 with multiple variables

$$f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = x \cos(x) \quad \checkmark$$

$$f: \mathbb{R}^2 \rightarrow \mathbb{R}, f(x, y) = x^2 + y^3$$

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

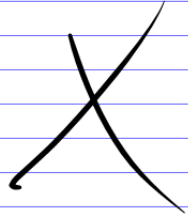
$$f: \mathbb{R}^2 \rightarrow \mathbb{R}^2, f(x, y) = (x^2 + y^2, xy)$$

$$f: \mathbb{R}^3 \rightarrow \mathbb{R}, f(x, y, z) = x^2 + y^2 + z^2$$

limit,
cont.,
deriv.,
int

Panel 9

$$f: \mathbb{R} \rightarrow \mathbb{R} \text{ , e.g.}$$

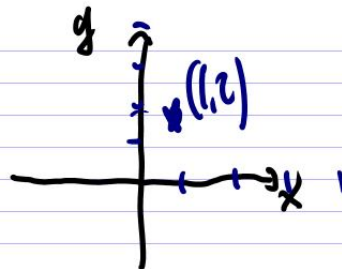


Panel 10

Introducing \mathbb{R}^3

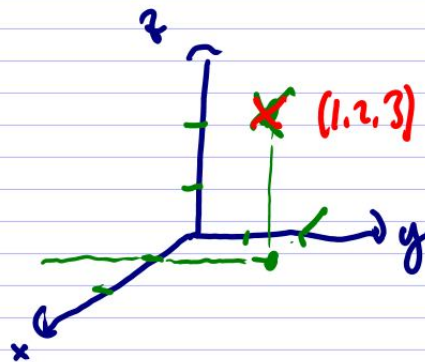
Coordinate system in \mathbb{R}^2 :

Ex: plot $(1,2)$, $(4,3)$



Coordinate system in \mathbb{R}^3 :

Ex: plot $(1,1,1)$, $(1,2,3)$



x-axis: all points $(x, 0, 0)$

y-axis:

z-axis:

xy plane: all points $(x, y, 0)$

yz plane:

xz plane:

$(0, 0, z)$

$(x, 0, z)$