

[illegible]

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final exam (cont)

of points $y = mx + b =$
 $5 = -2/3(-2) + b \rightarrow b = 3 \frac{2}{3}$ -----
the line is $y = -2/3 x + 3$
 $2/3$ ----- evaluate it at $x =$
 -0.5 to find $y(-0.5)$: y
 $-0.5 = -2/3 (-0.5) + 3$
 $y(-0.5) = 4$
Approach(pointslopeform) $2: y -$
 $y_1 = m(x - x_1)$
find the slope $m = -2/3$
 $y - 3 = -2/3(x - 1) \rightarrow y - 3 = -2/3 \square$
 $\square + 2/3$ ----- $y = -2/3x + 2/3 + 3$
 $\rightarrow y = -2/3x + 3 \frac{2}{3}$
the line is $y = -2/3 x + 3 \frac{2}{3}$
evaluate it at $x = -0.5$ to find
 $y(-0.5)$: $y - 0.5 = -2/3$
 $(-0.5) + 3$
 $y(-0.5) = 4$
! : Linear Interpolation easy to do, BUT NOT best go-to solution if need accuracy. **Spline Interpolation**: A spline is to use a different polynomial between each pair of discrete points. **Cubic splines** correct for this flaw by ensuring that at the data points, the adjacent splines have the same 0th, 1st and 2nd derivatives; **Curve fitting** is "the process of constructing a curve, or mathematical function, that has the best fit to a series of data points, possibly subject to constraints *polyval*, *poly fit*"; **! / operator** use it to solve least squared problems (less error). **! Goal** is the minimize the **residuals**: the difference between the actual and predicted values at a given point (i.e.

final exam (cont)

the error). take its derivative and look to see where it is zero (this gives us the **extrema** – the extreme points of the function) to find the minimum of function; **! numerical differentiation** tends to amplify noise. **Taylor series** is a series expansion of a function $\square(x)$ about a given point $\square$. special case, known as **Maclaurin series**, of the Taylor series exists in which $a = 0$.
! The "Big O" notation (asymptotic notation) indicates higher order terms (H.O.T.s). **Central Difference**: **gradient**; **Root Finding**: zero a function; **fzero**..
! : finding area under curve: Rectangles, Trapezoids, Parabolas. **Riemann Sums**: **! If you average the left and right Riemannsum**, you get the trapezoidal sum. **Left Riemann Sum**: fits rectangles underneath curve using left of interval as location for height of rectangle; Overestimate if f decreasing & vice versa. **Right Riemann Sum**: like left Riemann Sum but in right instead; Overestimate if f is increasing and vice versa. **Middle Riemann Sum**: Approximates the function by its value at the middle point of the subinterval, yielding multiple rectangles with a base of Δx and the average height between the left and right. **! This better than R & L Riemann sum**. **Trapezoidal Rule**: Approximates the function by fitting trapezoids underneath the curve. **Simpson's Rule**: Approximates the function by fitting parabolas under the curve.

final exam (cont)

! : must use an even number of intervals; Pros and cons of using this versus trapezoids – more computationally expensive, but a better fit at times. **! Left-point and right-point sums** were just wrong **! mid-point, trapezoidal and Simpson's** all got the correct answer. The choice between these depends on what the data looks like and what computational expense you can tolerate. **solve differentialequations**: Euler's Method(forward Euler method), Runge-Kutta methods. **"state-space"**: break your system down into a system of simultaneous first order differential equations. **! The number of first order equations will be equal to the sum of number of independent variable(s) times the order..**

tables

Symbolic Command	Description	Symbolic Command Description Numeric Analog
ezplot	2D plot	plot
ezmesh	Wireframe mesh	mesh
ezmeshc	Contour plot under wireframe mesh	meshc

tables (cont)

ezsurf	Surface plot	surf
ezsurf	Contour plot under surface plot	surf
ezcontour	Contour plot	contour
ezcontourf	Filled contour plot	contourf
ezplot3	3D plot	plot3
ezpolar	Polar plot	polar



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