Skeleton Calendar of course. Week-by-week:

Week 1.

Jan 8. Class 1. 3.1, 3.2, 3.4: What is a derivative? Derivative of a function (at a point) as the slope of the tangent line to the graph (at that point of the graph). The Main ideas of calculus: breaking up functions into little lines (19A). Reassembling all these little lines together the recover the function (19B). Sign of derivative and monotonicity: Boxed theorem 2 p. 211 of section 4.3.

Going over Syllabus.

Suggested outside reading: MIT course , eg. Jerrison, lecture 1. Hsiang.

Jan 10: 3.4; p. 57, 3.2,3.3 : What is the derivative, again? If f is distance travelled (odometer) then its derivative is the instantaneous velocity (speedometer). Leibniz notation. $F = ma$ as an ODE. Differentiation as a linear operator on functions. Algebraic rules of differentiation . (see the boxes on web site). Power law, again. 3.3: product rule.

ADDITIONAL READING: Strang, ch.1

Jan 12 : R Mont gone. May have a guest lecturer, or class cancelled.

Week 2.

M Jan 15: MLK holiday.

W. Jan 17: 4.1, 5.9; Differentiating polynomials. 4.1 : 1st order taylor approximation. $\sqrt{102}$. ODEs. $y' = y$. The exponential function. Solving $y' = 0$. $y'' = 0$. y' = y and exp.

Fri . Jan 19. 3.7; 3.6: Chain rule. $kf(t)$ vs $f(kt)$. Proof of change of variables formula for linear changes of variables. Solving $y' = ky$. Solving $f' = g, g' = -f$. Derivatives of trig functions. Harmonic oscillator: $f'' = -f$.

Week 3

M Jan 22 : 3.7. Chain rule, full blown. Examples.

Jan 23. 3.5; 4.4. – The 2nd derivative and convexity. Graphical insights: 4.4. 1st and 2nd order Taylor approximation.

Jan 25: Another look at exponentials, sines, cosines, and polynomials. $y = e^{ix}$ and sin and cos.Web box. Graphical insights and asympotics.

Week 4.

M Jan 29: 3.7; all sections covered so far. More practice with chain rule. Conceptual interpretations.

W Jan 31: Review and Practice.

F Feb 2: Midterm.

week 5:

M Feb 5. Midterm discussion. On to minimizing and maximizing functions: 4.2.

W Feb 7 : 3.5., again. 4.4: 2nd derivative test for a local min or max. (p. 218). 2nd order Taylor appoximation

Fri Feb 9 : Applications of extremizing. 4.7. More extreme values. 4.7: "applied optimization"

week 6:

Feb 12: Theorems: Mean value (4.3); the speedometer/odometer reality check. Intermediate value theorem (2.8).

Feb 14; more on monotonicity; change of variables – 4.3 ct'd.

Feb 16. Graphing. Qualitative reasoning: 4.4, 4.6 again.

week 7:

M Feb 19: HOLIDAY. President's Day.

W Feb 21. L'Hopital's rule and quotients of Taylor expansions: 4.5, 8.4, 10.7

Fri. Feb 23 : Peeks at integration. 5.1-5.2. Statements of fund thm of calculus.

week 8:

M Feb 26 5.1- 5.4. anti-derivatives. integration.

W Feb 28. 5.1- 5.4. anti-derivatives. integration. statements of fund thm of calculus.

Fr Mar 2. 5.3 Some anti-derivatives. Some more ODEs.

week 9 :

M Mar 5 Kepler and Newton 13.6

W Mar 7 Kepler and Newton, ct'd 13.6. [Pollard?]

Fr Mar 9. Newton's method for finding zeros, vs bisection. 4.8.

week 10:

distribute sections: 3.8; 2.2-2.5 implicit differentiation: 3.8; Cycling back: limits, discontinuous functions, a bit of rigor. 2.2 - 2.5. Review

M Mar 12

W Mar 14

Fri Mar 16: Review. Last class...

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week 11: Finals week.