Math 229 Syllabus with Video Suggestions

If you find other helpful videos on any of these topics, please send the link to veitch@math.niu.edu.

I. **Algebra, Review, and stuff everyone should know**

(a) Basic Functions (ex. $y = mx + b$, $y = x^n$, $y = |x|$, $y = \frac{1}{x}$, etc.)
http://www.youtube.com/watch?v=i37Zvv-T37Q

(b) Composition of Functions and finding their Domain
http://www.youtube.com/watch?v=4z9ElTz4inQ
http://www.youtube.com/watch?v=_zy7Uro7iCg
http://www.youtube.com/watch?v=kAqaPxusaDg

(c) Introduction to Tangent Lines and Instantaneous Rate of Change
http://www.youtube.com/watch?v=yuEKC93wd_E

II. **Limits, Continuity, and Theorems**

(a) Introduction to Limits
http://www.youtube.com/watch?v=Suy3jH2Rz44
http://www.youtube.com/watch?v=l7Tcay720vw

(b) Limit Laws
https://www.youtube.com/watch?v=lSwsAFgWqR8#!

(c) Limit of a Function (algebraically)
https://www.youtube.com/watch?v=EAa3J_nDkoI#!

(d) Infinite Limits
https://www.youtube.com/watch?v=7dpsjhFZiGA

(e) The precise definition of a limit
https://www.youtube.com/watch?v=-ejyeII0i5c

(f) One-sided limits
https://www.youtube.com/watch?v=3iZUK15aPE0

(g) Determine the continuity of a function graphically
https://www.youtube.com/watch?v=hlorAjS0xWE

(h) Determine the continuity of a function algebraically
https://www.youtube.com/watch?v=VUEM6vWJvE4

(i) Intermediate Value Theorem
https://www.youtube.com/watch?v=g9QRNbJLs94

III. **Derivatives**

(a) Secant Lines and the Tangent Line
https://www.youtube.com/watch?v=1YtQEQ-HpqI

(b) Find a derivative by using slopes of secant lines

http://www.youtube.com/watch?v=wU05N55Xyv8
http://www.youtube.com/watch?v=JI3KQC3EcY0

(c) Limit Definition of a Derivative
https://www.youtube.com/watch?v=ynxQukKwl-Y

(d) Sketch the graph of a derivative
http://www.youtube.com/watch?v=QoTGPUArfTI
http://www.youtube.com/watch?v=Gbtma_UQpro

(e) Intro to using the power rule for derivatives
https://www.khanacademy.org/math/calculus/differential-calculus/power_rule_tutorial/v/power-rule

(f) Find a derivative using the power rule
http://www.youtube.com/watch?v=mfNbV9q15mg
http://www.youtube.com/watch?v=WrW5wVgZ3Rs

(g) Find a derivative using the product rule
http://www.youtube.com/watch?v=9ps2xOsNeFI
http://www.youtube.com/watch?v=qby4iORgoK8

(h) Find a derivative using the quotient rule
http://www.youtube.com/watch?v=K3MxofAF-9o
http://www.youtube.com/watch?v=uM_VgMPU2NY

(i) Find a derivative using the chain rule
https://www.youtube.com/watch?v=IiBC4ngwH6E
https://www.youtube.com/watch?v=669qw1XsU0s
https://www.youtube.com/watch?v=svpSx8TpX7E
https://www.youtube.com/watch?v=DYb-AN-lK94#!

(j) Find a derivative of trigonometric functions
https://www.youtube.com/watch?v=-VdN5Qk_m6A

(k) Find a derivative using multiple rules
http://www.youtube.com/watch?v=cngzQ5xIOBY
http://www.youtube.com/watch?v=IZzSvA8zBTY
Note: The next video uses derivatives you don't know yet.
https://www.youtube.com/watch?v=aEP4C_kvcO4

(l) Find a derivative using implicit differentiation
https://www.youtube.com/watch?v=5yTVUZCaU6k
https://www.youtube.com/watch?v=hrg1hCzg3W0
https://www.youtube.com/watch?v=mSVrqKZDRF4
https://www.youtube.com/watch?v=KyYC8XzKsHU
https://www.youtube.com/watch?v=2CsQ_l1S2_Y

IV. **Applications of Derivatives**

(a) Find the equation of a tangent line to a curve
This video finds the derivative using the limit definition
http://www.youtube.com/watch?v=SiyNlO2T01c

http://www.youtube.com/watch?v=64mxT6b6qz4

(b) Solve problems relating to velocity and acceleration
http://www.youtube.com/watch?v=D6KIk9RQHXk
http://www.youtube.com/watch?v=pFeuGMMiZWw
http://www.youtube.com/watch?v=-Bvq6HYiECQ
http://www.youtube.com/watch?v=ylEniPB9F04

(c) Solve related rates problems using implicit differentiation
https://www.youtube.com/watch?v=kBVDSu7v8os
https://www.youtube.com/watch?v=wV59XWLmv0c
http://www.youtube.com/watch?v=jHBqcKW4Xk0
http://www.youtube.com/watch?v=Xe6YlrCgkIo
https://www.youtube.com/watch?v=cPOjnyjii-4

(d) Find an approximate function value using the tangent line (Linearization) or differentials
http://www.youtube.com/watch?v=d3w2r0h3Mck
http://www.youtube.com/watch?v=4Sj82-vx8Z8
https://www.youtube.com/watch?v=l8PFsYI3bzw

(e) Mean Value Theorem
https://www.youtube.com/watch?v=bGNMXfaNR5Q

(f) Extreme Value Theorem
http://www.youtube.com/watch?v=Y39ZivDpIe0

(g) Identifying Extreme Values on a graph
http://www.youtube.com/watch?v=votVWz-wKeI

(h) Use the first derivative to find extreme values
http://www.youtube.com/watch?v=0gJJ6qxq1EM
http://www.youtube.com/watch?v=SwiFEtFEMEM

(i) Use the derivative to determine increasing and decreasing intervals
https://www.youtube.com/watch?v=lFQ4kMcODzU
http://www.youtube.com/watch?v=jJb_Qk0O5a0

(j) Use the derivative to identify local max and mins
https://www.youtube.com/watch?v=pInFesXIfg8

(k) Use the second derivative to determine concavity and points of inflection
https://www.youtube.com/watch?v=LcEqOzNov4E
https://www.youtube.com/watch?v=UK2shgCXALo

(l) Sketch the graph of a function using the first and second derivatives
http://www.youtube.com/watch?v=ojcp0GJKluM
https://www.youtube.com/watch?v=hIgnece9ins
http://www.youtube.com/watch?v=aWV4khIBvCM

(m) Solve optimization problems using the derivative
(n) Correctly applying Newton's Method

V. **Integrals**

(a) Use left, right, and midpoint Riemann sums to approximate area
(b) Evaluating definite integrals by using limit of a Riemann Sum
(c) The Fundamental Theorem of Calculus Part 1
(d) The Fundamental Theorem of Calculus Part 2
(e) Antiderivatives and Indefinite Integrals
(f) Use substitution to evaluate an integral (definite and indefinite)