Calculus 2 (Math 120, Math 128*) Common Topics List[1]

1. **Integration**

    (a) antiderivatives

    (b) Riemann sums

        (i) definition of definite integral

        (ii) area problem

    (c) Numerical Integration

        (i) left, right, midpoint

        (ii) over estimation or under estimation

    (d) Fundamental Theorem of Calculus

    (e) Techniques of Integration

        (i) u-substitution

        (ii) integration by parts*

    (f) Applications

        (i) area between curves

        (ii) specific problems that lead to an integral via Riemann sums (e.g. work, average of a function, ...)

    (g) Improper Integrals*

    (h) L'Hôpital's Rule*

2. **Sequences and Series***

    (a) sequences

        (i) definition/idea

        (ii) convergence/limit

    (b) Special Series

        (i) geometric

        (ii) harmonic

        (iii) alternating

        (iv) p-series

    (c) Series Convergence Tests

        (i) integral

        (ii) p-series

        (iii) alternating series

        (iv) comparison **or** limit comparison

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[1]This list was approved by the department on 10/15/18.
All items on this list, with the exception of the additional topics, will be covered in Math 120.
Items marked with an asterisk will be taught in Math 128.

(v) ratio **or** root

3. **Taylor Polynomials***

    (a) an application of Taylor polynomials (e.g. approximate a definite integral, a limit)

4. **Taylor Series***

    (a) Taylor series usually converge to the original function (note the counterexample: $f(x) = e^{-\frac{1}{x^2}}$ for $x \neq 0$, $f(x) = 0$ for $x = 0$).

    (b) power series define (possibly non-elementary) functions

    (c) know the Taylor series for e^x, $\frac{1}{1-x}$, $\sin x$, $\cos x$

5. **Power Series***

    (a) operations on series (differentiation, integration, ...)

    (b) radius and interval of convergence

Examples of Additional Topics

- More numerical techniques of integration: trapezoidal rule, Simpson's rule

- partial fractions

- trigonometric integrals

- trigonometric substitutions

- applications of Taylor polynomials to physics

- Fourier series (only for 128)

- Laplace transforms (only for 128)