MATH 19 MIDTERM TOPICS
FALL 2016
BROWN UNIVERSITY
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Note: you should have memorized the appendix (the last page of the course notes). If you haven't done this already, now is the time. I would provide a cheat sheet for this, but the amount of content is modest, and having these things on speed dial in your mind will be significantly more beneficial to you.

Integration by parts. Be able to do indefinite and definite integration by parts problems.

Resonance integrals. The integral of the product of two basic waves over a full period $[0, 2\pi]$ is equal to 0 if the waves are different and π if they are the same. You should have facility with using that fact to solve problems (do not try to rederive this fact every time).

Trig integrals. Be able to integrate function of the form $\cos^m x \sin^n x$ where m and n are nonnegative integers. Be able to integrate functions of the form $\sec^m x \tan^n x$ whenever m is even or n is odd.

Trig substitution. Be able to do trig sub integrals.

Force, work, and energy. Be able to calculate work as an integral of force with respect to distance, and calculate potential energy as the amount of work it takes to move an object from one place to another. Know that potential energy in the earth's gravitational field can be calculated as mgh.

Arclength. Know how to determine bounds and compute the arc length of the graph of a function over an interval.

Polar coordinates. Be able to convert back and forth between Cartesian and polar form of an equation and calculate the area of a region bounded by curves specified in polar coordinates.

Complex numbers. Basic complex arithmetic, conversion to and from polar form $r \operatorname{cis} \theta$, behavior of multiplication in polar form, geometric interpretation of multiplication as a scaling/rotation, solving polynomial equations using roots-of-unity techniques, and Euler's formula.

Differential equations. Be able to identify whether a DE is linear, and whether a linear DE is homogeneous. Be able to find a general solution of a linear homogeneous differential equation with constant coefficients.

Initial value problems. Be able to use initial data to determine the constants in the general solution of a DE.