Final Exam Expectations

Prerequisites
Same as for Midterms 1 and 2.

Unit I Material
Just to reiterate the integral table entries you should have memorized:

• The power rule: $\int x^p \, dx = \frac{x^{p+1}}{p+1} + C$ when $p \neq -1$ and $\int x^{-1} \, dx = \ln |x| + C$.

• $\int e^x \, dx = e^x + C$

• $\int b^x \, dx = \frac{b^x}{\ln b} + C$ for $b > 1$ (*)

• $\int \sin x \, dx = -\cos x + C$ and $\int \cos x \, dx = \sin x + C$

• $\int \tan x \, dx = \ln |\sec x| + C$ (*) and $\int \sec x \, dx = \ln |\sec x + \tan x| + C$

• $\int \sin^2 x \, dx = \frac{x - \sin x \cos x}{2} + C$ (**) and $\int \cos^2 x \, dx = \frac{x + \sin x \cos x}{2} + C$ (**) 

• $\int \tan^2 x \, dx = \tan x - x + C$ (**) and $\int \sec^2 x \, dx = \tan x + C$

• $\int \frac{dx}{\sqrt{1 - x^2}} = \arcsin x + C$ and $\int \frac{dx}{x^2 + 1} = \arctan x + C$

• $\int \ln x \, dx = x \ln x - x + C$ (***)

(*) Can be derived by substitution from an earlier entry. (**) Can be derived from an earlier entry using one or more trig identities. (***) Can be derived using integration by parts.

All other expectations from Midterm 1 apply.
Unit II Material

All expectations for Midterm 2 apply.

Unit III Material

• You should know what a parametric curve is.
• You should be able to use parametric functions to describe the motion of a particle in 2 or more dimensions.
• You should be able to determine from the position functions the start and endpoints of a parametric curve.

• You should know the formulas for the velocity and speed of a particle whose motion is described by given position functions, and you should be able to determine whether (and when) a particle stops.
• You should be able to find the tangent line to a parametric curve at a given time.
• You should know the parametric arclength formula

$$\ell = \int_{a}^{b} \sqrt{x'(t)^2 + y'(t)^2} \, dt$$

and its Cartesian version (for $y = f(x)$)

$$\ell = \int_{a}^{b} \sqrt{1 + f'(x)^2} \, dx$$