Student Questions on Test 4

Question: Did we do arc length in polar coordinates?

Answer: No, we did not. We'd need to know about arc length in polar coordinates in order to, for example, predict the speed of a comet, but that topic won't be on this exam.

Question: Will be asked to sketch graphs of curves like $r = \sin 3\theta$?

Answer: For a problem this complicated there are two possibilities. Either we take a long time to sketch it out or we get a hint that the curve traces out a three leafed rose.

In general, we won't be told which techniques of integration to use to compute the integrals on the test. However, for integrals we're likely to get stuck on, we'll get a hint or instructions on how to proceed (or not to proceed).

In setting up integrals from the later half of the unit we'll always need to do three key steps: finding the lower limit, the upper limit, and the integrand. The second step would be to evaluate the integral, which may or may not be required on the test (or possible).

Question: Can you review what to do when the denominator of a partial fractions problem has a repeated factor?

Answer: Suppose we have:

$$\frac{x^2 + 21}{(x+2)^2\, x\, (x+1)}$$

We'll have one variable for each factor in the denominator. The setup looks like:

$$\frac{x^2 + 21}{(x+2)^2\, x\, (x+1)} = \frac{A}{x+2} + \frac{B}{(x+2)^2} + \frac{C}{x} + \frac{D}{x+1}.$$

If we instead have

$$\frac{x^2 + 21}{(x+2)^3\, x\, (x+1)},$$

the setup will look like:

$$\frac{x^2 + 21}{(x+2)^3\, x\, (x+1)} = \frac{A}{x+2} + \frac{B}{(x+2)^2} + \frac{E}{(x+2)^3} + \frac{C}{x} + \frac{D}{x+1}.$$

The more repeated roots there are, the harder the problem gets. The cover up method only helps you solve for one variable for each different factor in the denominator; we can use it to solve for C, D and E but not for A or B. To find A and B you'll either have to plug in values or use other algebraic tools for solving a system of equations.

Question: Does the $x^3 + 21$ in the numerator affect the setup?

Answer: The answer is almost "no". The setup will always look like this, but if the degree of the numerator is too large you'll have something like an improper fraction and will need to use long division before you can apply the method of partial fractions.

Question: Will we need to know how to do reduction formulas?

Answer: If a reduction formula or something else out of the ordinary is required to complete an integral, you will be told what you need to do.

Question: In the partial fractions method, what happens if you have a quadratic in the denominator?

Answer: Suppose we're asked to decompose:

$$\frac{x^2+21}{(x^2+2)^2\,x\,(x+1)}.$$

Our setup would look like:

$$\frac{x^2+21}{(x^2+2)^2\,x\,(x+1)} = \frac{A_1x+B_1}{x^2+2} + \frac{A_2x+B_2}{(x^2+2)^2} + \frac{C}{x} + \frac{D}{x+1}.$$