Lecture 21 Tuesday, February 18, 2025 1:30 AM

Practice on the Separation of Variables method and the Integrating Factor method on the worksheet.

Integrating factor is a general idea that can work for differential equations other than linear first order equations. For example, the *Bernoulli's differential equations* are those of the form

 $y' + p(x)y = q(x)y^n$

The trick is that you divide both sides by y^n and the use the substitution $z = y^{1-n}$. You will get a linear first order equation in z. You will use the integrating factor to solve for z. Equivalently, you can multiply the Bernoulli's equation by the integrating factor:

 $u = (1-n)y^{-n}e^{\int (1-n)p(x)dx}$

Then the left hand side will be exactly the derivative of $y^{1-n}e^{\int (1-n)p(x)dx}$.