# The Integrating Factor

Mathematics

The standard method for a first-order linear equation, in order.

*For the linear equation dy/dx + P(x)y = Q(x).*

1. **Put it in standard form**
   The coefficient of dy/dx must be 1. Divide through if it is not.

2. **Compute the factor**
   μ(x) = e raised to the integral of P dx. Drop the constant here.

3. **Multiply the equation by μ**
   The left side then becomes the exact derivative of the product μy.

4. **Integrate both sides**
   μy equals the integral of μQ dx, plus C. The constant belongs here.

5. **Divide by μ and check**
   Solve for y, then substitute back into the original equation.

**Worked: dy/dx + 2y = e^(−x) has μ = e^(2x), which gives the solution y = e^(−x) + C e^(−2x).**