

MA22S3 Tutorial Sheet 6.¹²

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Useful facts:

- To solve the equation $\dot{y} + py = f$ multiply across by an integrating factor $\exp(\int_a^t p(\tau) d\tau)$ and express the right hand side as the derivative of a product.
- This gives solution

$$y(t) = y(a)e^{-I(t)} + e^{-I(t)} \int_a^t f(\tau)e^{I(\tau)} d\tau \quad (1)$$

- $\int \cot t dt = \ln |\sin t| + C$

Questions

1. (2) Obtain the solution to $\dot{y} - 3y = e^{-t}$ with $y(0) = 1$; since an initial condition is chosen at $t = 0$, choose $a = 0$.
2. (3) Obtain the solution to $\dot{y} + y \cot t = \cos t$ with $y(\pi/2) = 0$.
3. (3) Obtain a general solution to $(t+1)\dot{y} + y = (t+1)^2$

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²Including material from Chris Ford, to whom many thanks.