

Some problems involving integrating factors

1. Suppose the differential equation $M(t, y) + N(t, y) \frac{dy}{dt} = 0$ is not exact (on some given rectangle in the ty -plane). You want to look for an integrating factor μ that depends only on y . What condition must be satisfied by M , N , and the partial derivatives of M and N ?
2. Solve the initial value problem $(3ty + y^2) + (t^2 + ty) \frac{dy}{dt} = 0$, $y(2) = 1$.
3. Solve the differential equation $y \cos(ty) + (\sin(ty) + t \cos(ty)) \frac{dy}{dt} = 0$.