

Math 252 – Steps to Determine Type of 1st-order DE

Questions to ask:

1. Is it separable?
 - a) linear: $\frac{dy}{dx} + P(x)y = Q(x)$
 - b) Bernoulli: $\frac{dy}{dx} + P(x)y = Q(x)y^n$
 - c) homogeneous: $M(x, y)dx + N(x, y)dy = 0$ where M and N both have same degree
 - d) $f(Ax + By + C)$: $\frac{dy}{dx} = f(Ax + By + C)$

3. Is it exact? Must be in form $M(x, y)dx + N(x, y)dy = 0$.
 - a) Check to see if $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$. If so, it's exact.
 - b) If it's not exact:
 - i. Check $\frac{M_y - N_x}{N}$ to see if it's a function of x only. If it is, then the integrating factor is $e^{\int \frac{M_y - N_x}{N} dx}$.
 - ii. Check $\frac{N_x - M_y}{M}$ to see if it's a function of y only. If it is, then the integrating factor is $e^{\int \frac{N_x - M_y}{M} dy}$.