

# Section 2.2 to 2.5: Choosing the Method

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example: identify the method(s) to solve the DE:

$$a) \frac{dy}{dx} - x^2 + 3x^2y = 0$$

$$\frac{dy}{dx} = x^2 - 3x^2y$$

$$\frac{dy}{dx} = x^2(1-3y)$$

$$\frac{dy}{1-3y} = x^2 dx$$

separable

$$\frac{dy}{dx} + 3x^2y = x^2$$

$$IF = e^{\int 3x^2 dx}$$

$$= e^{x^3}$$

linear first order

not Bernoulli  
not homogeneous  
not  $f(Ax+By+C)$

- not exact

$$b) \overbrace{(2xy^2 - 3)}^M dx + \overbrace{(2x^2y + 4)}^N dy = 0$$

$y^2 dy$  means not Bernoulli

not separable

not linear  
 $y^2$

not homogeneous  
 $x^2y$  has degree 3  
 $4$  has degree 0

$\frac{dx}{x+y} = \frac{dy}{\text{different terms in } x+y}$

try exact?

$$\frac{\partial M}{\partial y} = 4xy$$

$$\frac{\partial N}{\partial x} = 4xy$$

exact

standard form for linear first order:

$$\frac{dy}{dx} + P(x)y = f(x)$$

standard form for Bernoulli:

$$\frac{dy}{dx} + P(x)y = Q(x)y^n$$