

# Exact Equations Template

Form:

$$M(x, y) + N(x, y) y' = 0$$

Problem:

Rewrite with value of $k$

1. Partial Derivative of M with respect to y:  $\frac{d}{dy} M$

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2. Partial derivative of N with respect to x:  $\frac{d}{dx} N$

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3. Are 1 and 2 equal? If yes continue. If not equal due to a constant  $k$ , solve for  $k$ .

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## Exact Equations Template (cont.)

4.  $f_x(x, y)$ : Integrate  $M$  with respect to  $x$ :  $\int M dx$

Note: replace the constant of integration  $C$  in this case with  $h(y)$

5. Take the derivative of the result of step 4 with respect to  $y$ :

$$\frac{d}{dy} \left( \int M dx \right)$$

Note: The solution of step 5 should look similar to the form of:  $x^2 + 6x + h'(y)$ , where  $h'(y)$  is the derivative of the constant of integration from step 4.

6. Set result of step 5 equal to  $N$ , solve in terms of  $h(y)$ :

Note: You will have to integrate  $h'(y)$

7. plug  $h(y)$  into result of step 4