

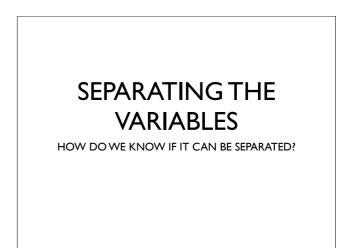
## DEFINITION

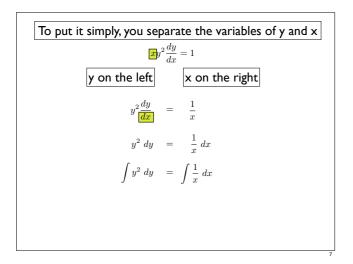
- A differential equation is an equation involving a differential coefficient i.e.  $\frac{dy}{dx}$
- In this syllabus, we will only learn the <u>first</u> <u>order</u>
- To solve differential equation  $\frac{dy}{dx}$ , we integrate and find the equation y which satisfies the differential equation

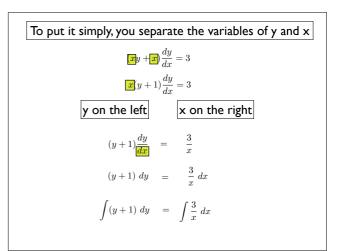
$\frac{dy}{dx} = x - 1 \qquad y = \int x - 1  dx \\ y = \frac{x^2}{2} - x + c \qquad y = \frac{x^2}{2} - x + 3 \\ y = \frac{x^2}{2} - x + 15$
$y = \frac{x^2}{2} - x - 30$

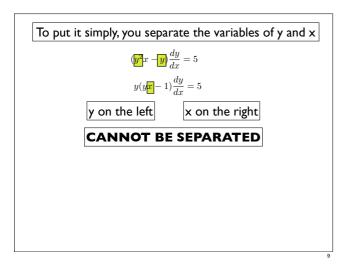
Example	General Solution	Particular Solution
$\frac{dy}{dx} = x - 3x^2$	$y = \int x - 3x^2 dx$ $y = \frac{x^2}{2} - \frac{3x^3}{3} + c$	
	-	
	$y = \frac{x^2}{2} - x^3 + c$	$y = \frac{x^2}{2} - x^3 + 7$
		$y = \frac{x^2}{2} - x^3 - 1$

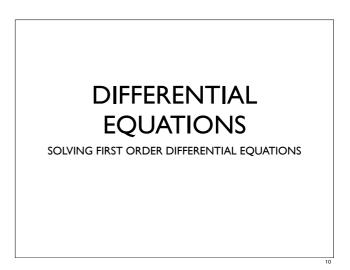
Example	General Solution	Particular Solution
$\frac{dy}{dx} = \sqrt{1-x}$	$y = \int \sqrt{1 - x}  dx$ $y = \int (1 - x)^{\frac{1}{2}}  dx$ $y = \frac{(1 - x)^{\frac{3}{2}}}{\frac{3}{2}(-1)} + c$ $y = \frac{-2(1 - x)^{\frac{3}{2}}}{3} + c$	$y = \frac{-2(1-x)^{\frac{3}{2}}}{3} + 20$ $y = \frac{-2(1-x)^{\frac{3}{2}}}{3} - 100$

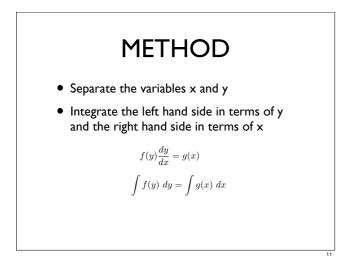


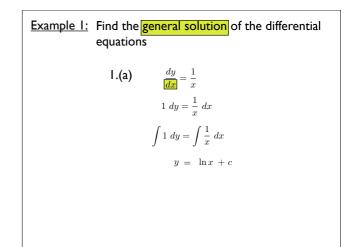


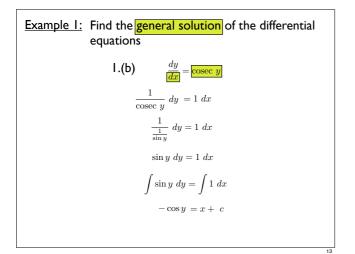


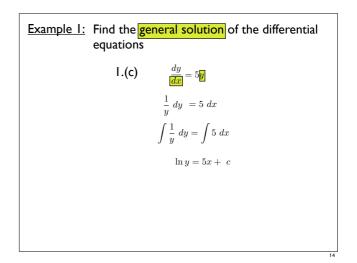


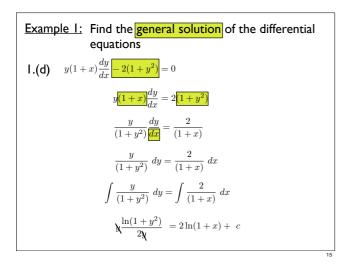


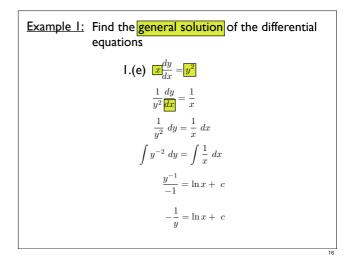


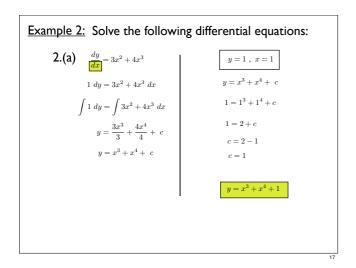


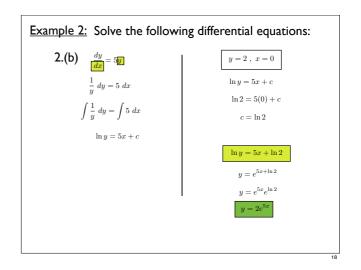


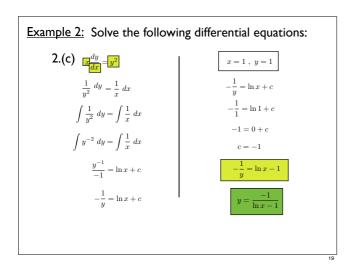


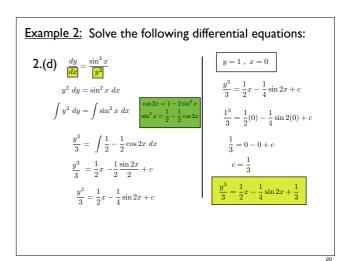


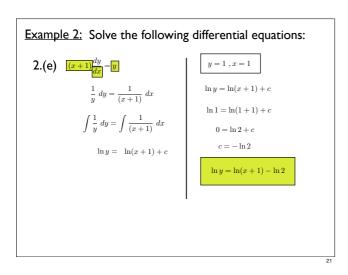


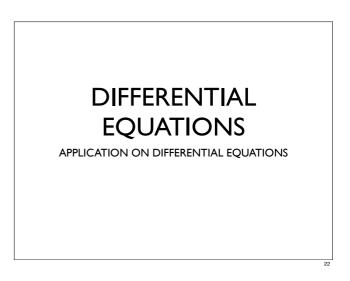


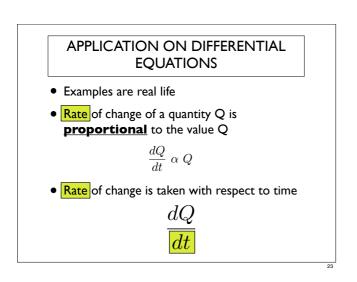


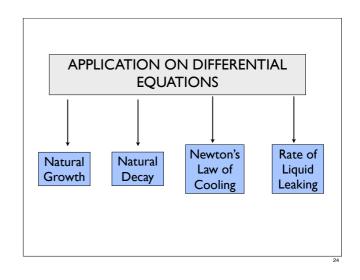


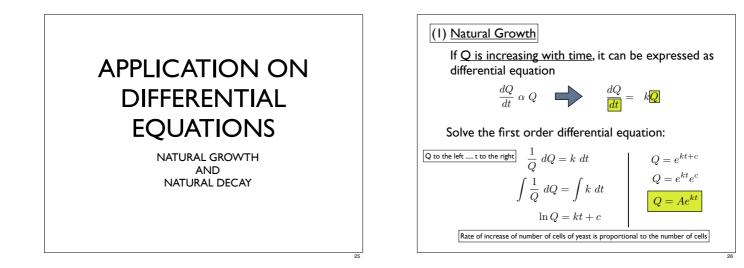


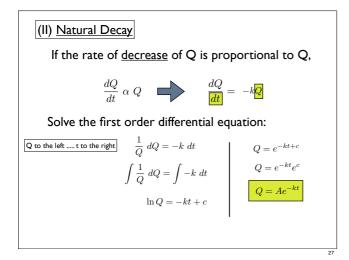


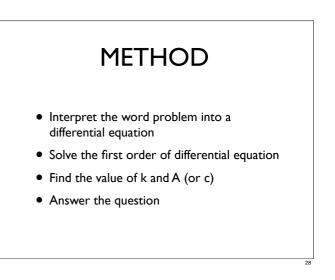


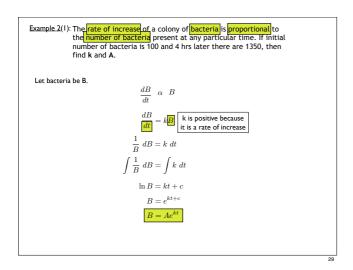


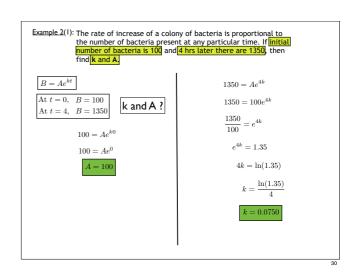


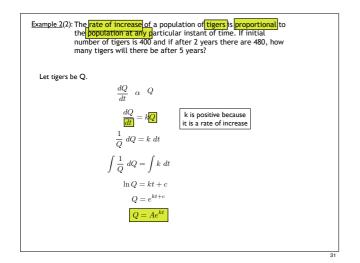


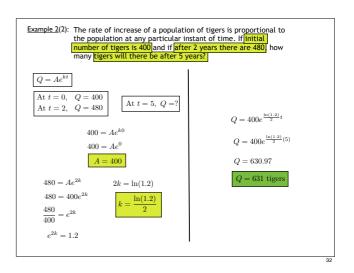


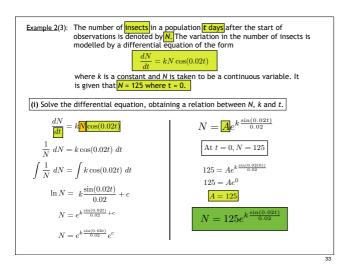


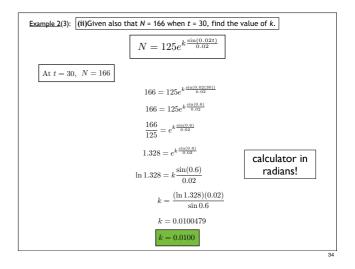


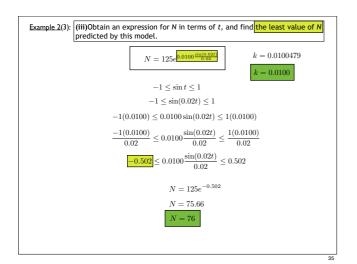


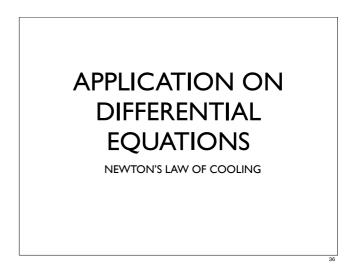


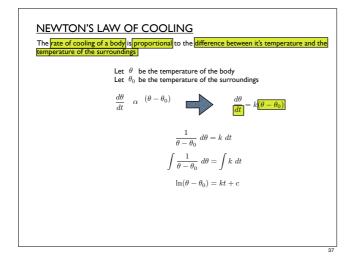


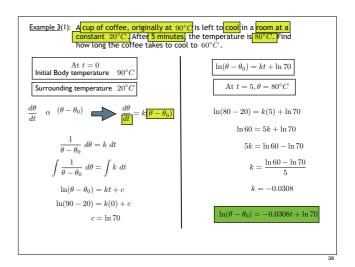


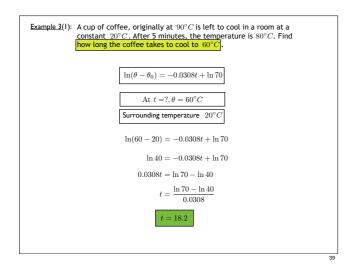


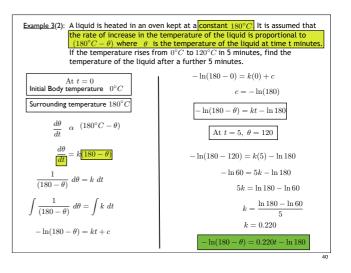


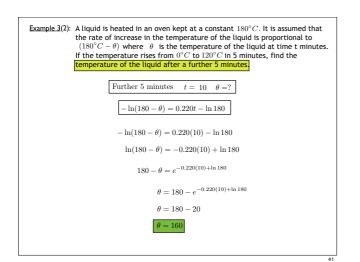


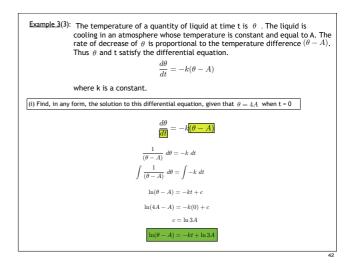




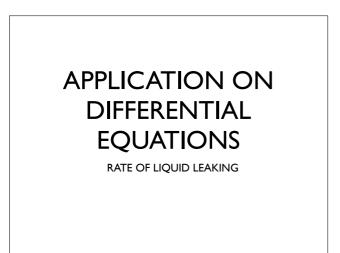








<b>Example 3(3):</b> (ii)Given also that $\theta = 3A$ when t=1, show that $k = \ln \frac{3}{2}$	Example 3(3): (iii) Find $\theta$ in terms of A when t = 2, expressing your answer in its simplest form.
$\boxed{ \begin{aligned} \ln(\theta - A) &= -kt + \ln 3A \\ \\ \hline \\ At \ t = 1,  \theta = 3A \end{aligned} }$	$\ln(\theta - A) = \left(-\ln\frac{3}{2}\right)t + \ln 3A$
$\ln(3A-A)=-k(1)+\ln 3A$	At $t = 2$ $\ln(\theta - A) = \left(-\ln\frac{3}{2}\right)(2) + \ln 3A$
$\ln 2A = -k + \ln 3A$	$\theta - A = e^{\left(-\ln \frac{3}{2}\right)(2) + \ln 3A}$
$k = \ln 3A - \ln 2A$	$ heta = e^{\left( -\ln rac{3}{2}  ight)(2) + \ln 3A} + A$
$k = \ln \frac{3A}{2A}$	$ heta=e^{\left(-\lnrac{3}{2} ight)(2)}e^{\ln 3A}+A$
$k = \ln \frac{3}{2}$	$ heta=e^{\left(-2\lnrac{3}{2} ight)}(3A)+A$
	$\theta = e^{\left(\ln\left(\frac{3}{2}\right)^{-2}\right)}(3A) + A$
	$ heta=e^{\left(\lnrac{h}{2} ight)}(3A)+A$
	$\theta = \frac{4}{9}(3A) + A$
	$\theta = \frac{4}{3}(A) + A \qquad \qquad \theta = \frac{7}{3}A$



## ON THE BOARD :D