

Test #1 Review - Phoebe Narcisse

Webwork Nonlinear Bernoulli: Problem 1

$$t^2 y' + 8t y = -y^2$$

$$y' + \frac{8t}{t^2} y = -\frac{1}{t^2} y^2$$

$$y' + 8t^{-1} y = -\frac{1}{t^2} y^2 \quad p(t) = 3t^{-1} \quad r = 2$$

$$q(t) = \frac{-1}{t^2}$$

$$y' + 3t^{-1} y = 0$$

$$y = Ce^{-\int p(x) dx} = Ce^{-\int 3t^{-1} dt} = Ce^{-3 \int \frac{1}{t} dt}$$

$$= Ce^{-3 \ln|t|} = e^{c-1} = e^{-3 \ln(t)} = e^{\ln(t)^{-3}} = t^{-3}$$

$$\frac{u'}{u^r} = q(t) y_1^{r-1}$$

$$\frac{u'}{u^2} = -\frac{1}{t^2} t^{-3(1)}$$

$$\int \frac{u'}{u^2} du = \int -\frac{1}{t^2} t^{-3} dt$$

$$\frac{-1}{u} = -1 \int \frac{t^{-3}}{t^2} dt$$

$$= -1 \int t^{-5} dt$$

$$= \frac{-1 t^{-4}}{-4} \text{ # } u$$

$$\frac{-1}{u} \text{ # } u = \frac{t^{-4}}{4} \text{ # } u$$

$$\frac{-4}{u} = t^{-4} \text{ # } u$$

$$\frac{-4}{t^{-4}} = u \text{ # } u$$

$$\text{# } u \quad -4t^4 = u$$

$$y = u y_1$$

$$\downarrow = (-4t^4)(t^{-3})$$

$$y = -4t + C$$

~~$$y = -4t + C$$

$$= -4t + C$$~~