

Name: _____

Quiz 2, Section 2.2, due on _____

(10 pts) Solve the differential equation $\frac{dy}{dx} = (1+y^2)(e^x + x^2e^{-x^3})$ with initial condition $y(0) = 0$ using separation of variables.

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

integrate

$$\begin{aligned} &\downarrow \\ u &= -x^3 \\ du &= -3x^2 dx \end{aligned}$$

$$\arctan(y) = e^x - \frac{1}{3}e^{-x^3} + C$$

$$y = \tan\left(e^x - \frac{1}{3}e^{-x^3} + C\right)$$

$$0 = y(0) = \tan\left(1 - \frac{1}{3} + C\right)$$

↘ set $1 - \frac{1}{3} + C = 0$, $C = -\frac{2}{3}$
to get " $0 = \tan 0$ "

so

$$y = \tan\left(e^x - \frac{1}{3}e^{-x^3} - \frac{2}{3}\right)$$