Please show **all** your work! Answers without supporting work will not be given credit. Write answers in spaces provided.

Name:_____

1. [**5 pts**] Find the general solution for the following differential equation:

$$\frac{dy}{dt} = 8e^{-4t-y}$$

Solution: <u>REWRITE:</u>

$$dy = 8e^{-4t-y}\, dt$$

$$dy = 8e^{-4t} \cdot e^{-y}\, dt$$

$$e^{y}\, dy = 8e^{-4t}\, dt \qquad [\textbf{2 pts}]$$

<u>INTEGRATE:</u>

$$\int e^{y}\, dy = \int 8e^{-4t}\, dt$$

$$e^{y} = \frac{8}{-4}e^{-4t} + C \qquad [\textbf{2 pts}]$$

<u>SOLVE FOR y:</u>

$$e^{y} = -2e^{-4t} + C$$

$$\ln\left(e^{y}\right) = \ln\left(-2e^{-4t} + C\right)$$

$$y = \ln\left(-2e^{-4t} + C\right) \qquad [\textbf{1 pt}]$$

2. [**5 pts**] Find the general solution for the following differential equation:

$$\frac{da}{dx} = -a^{2}x$$

Solution: <u>REWRITE:</u>

$$da = -a^{2}x\, dx$$

$$\frac{da}{a^{2}} = -x\, dx$$

$$a^{-2}\, dy = -x\, dx \qquad [\textbf{2 pts}]$$

<u>INTEGRATE:</u>

$$\int a^{-2}\, da = \int -x\, dx$$

$$-a^{-1} = -\frac{x^{2}}{2} + C \qquad [\textbf{2 pts}]$$

<u>SOLVE FOR a:</u>

$$\frac{-1}{a} = -\frac{x^{2}}{2} + C$$

$$\frac{1}{a} = \frac{x^{2}}{2} + C$$

$$a = \frac{1}{\frac{x^{2}}{2} + C} \qquad [\textbf{1 pt}]$$