

Crazy differential equations for you to solve

NAME:

1. Consider the diff. eq. $(ye^{-2x} + y^3)dx - e^{-2x}dy = 0$. Tell whether the equation is of each form given below. Show work and justification for your answers. If it is of a certain form, identify the parts (i.e. $P(x)$ and $Q(x)$ or $G(ax + by)$). If it is *not*, say why. Do *not* solve the equation.

a.) Is it homogeneous (in the form $\frac{dy}{dx} = G\left(\frac{y}{x}\right)$)?

b.) Is it Bernoulli (in the form $\frac{dy}{dx} + P(x) \cdot y = Q(x) \cdot y^n$)?

c.) Does it have linear coefficients (in the form $(a_1x + b_1y + c_1)dx + (a_2x + b_2y + c_2)dy = 0$)?

d.) Is it in the form $\frac{dy}{dx} = G(ax + by)$?

2. We will solve $\frac{dy}{dx} = \sin(x - y)$. Notice it is of the form $\frac{dy}{dx} = G(ax + by)$.

a.) First, show that $\frac{1}{1 - \sin z} = \sec^2 z + \tan z \sec z$. (Hint: Multiply left side by $\frac{1 + \sin z}{1 + \sin z}$.)

b.) Use the method shown in class to solve $\frac{dy}{dx} = \sin(x - y)$.