

Math 205

Quiz #8

1. Find the general solution to the following differential equation:

$$\frac{dy}{dt} + 2ty = 2te^{-t^2}.$$

$$e^{f(x)} \frac{dy}{dx} + 2te^{f(x)} y = 2te^{-t^2} e^{f(x)}$$

If

$$e^{f(x)} \frac{dy}{dx} + 2te^{f(x)} y = \frac{d}{dx} (e^{f(x)} y(x))$$

then

~~$$e^{f(x)} \frac{dy}{dx} + 2te^{f(x)} y = f' y + f y'$$~~

$$e^{f(x)} \frac{dy}{dx} + 2te^{f(x)} y = f' y e^{f(x)} + y' e^{f(x)}$$

Therefore,

$$f'(x) = 2x$$

$$\Rightarrow f(x) = x^2.$$

Therefore,

$$\frac{d}{dx} (e^{x^2} y) = 2x$$

$$\Rightarrow e^{x^2} y = x^2 + C$$

$$\Rightarrow y = x^2 e^{-x^2} + C e^{-x^2}.$$