

NSC 123
DIFFERENTIAL EQUATIONS
SPRING 2018

QUIZ 1

- (1) Write a differential equation that fits the physical description: “The velocity at time t of a cat moving along a straight line is proportional to the fourth power of its position x .”
- (2) Determine for which values of m the function $y = e^{mx}$ is a solution to the given equation.
- (a) $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 5y = 0$
- (b) $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 0$

- (3) Solve the equation for a general solution, and describe the general solution graphically:

$$\frac{dy}{dx} = -\frac{x}{y}$$

- (4) Solve the initial value problem:

$$\frac{dy}{d\theta} = \sin \theta + y^2 \sin \theta$$
$$y(0) = \sqrt{3}$$

- (5) Suppose a brine containing 0.3 kilograms of salt per liter runs into a tank initially filled with 400 liters of water containing 2 kilograms of salt. If the brine enters at a rate of 10 liters per minute, the mixture is kept uniform by stirring, and the mixture flows out at the same rate, find a formula giving the mass of salt in the tank after t minutes.