Notes – Differential Equations **name ____________________**
Section 6.3

1) $\frac{dy}{dx} = 5x^4$ (0, 2)

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

3) $y' = 9x^2y$ y(0) = 2

4) $\frac{dy}{dx} = \frac{3x^2}{e^{2y}}$ y(0) = 0.5

Verifying Solutions to Differential Equations

5) Determine whether the function is a solution of the differential equation $y'' - y = 0$.

a) $y = \sin(x)$

b) $y = 4e^{-x}$

6) Let f be a function with f(1) = 4 such that for all points (x, y) on the graph of f the slope is given by $\frac{3x^2+1}{2y}$.

a) Find the slope of the graph of f at the point where x = 1.

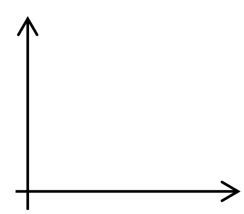
b) Write an equation for the line tangent to the graph of f at x = 1 and use it to approximate f(1.2).

c) Find f(x) by solving the separable differential equation $\frac{dy}{dx} = \frac{3x^2+1}{2y}$ with the initial condition f(1) = 4.

7) Exponential Growth and Decay

The rate of growth is directly proportional to the population.

$$\frac{dP}{dt} = k \cdot P$$



Example: A puppy weighs 2.0 pounds at birth and 3.5 pounds two months later. If **<u>the weight</u>** of the puppy during its first 6 months **<u>is increasing at a rate proportional to its weight</u>**, then how much will the puppy weigh when it is 3 months old?

Worksheet – Differential Equations **name** ____________________

Section 6.3

Find the particular equation for each differential equation and initial condition.

1) $\dfrac{dy}{dx} = y^2$ y(1) = -2

2) $\dfrac{dy}{dx} = \dfrac{x^3}{y^2}$ y(1) = 2

3) $\dfrac{dy}{dx} = \dfrac{1}{x}$ (1, 2)

4) $\dfrac{dy}{dx} = \dfrac{1}{3y^2}$ (2, -2)

5) $\dfrac{dy}{dx} = \dfrac{2x}{y}$ (2, 4)

6) $\dfrac{dy}{dx} = \dfrac{1+x}{xy}$ y(1) = -4

7) $\dfrac{dy}{dx} = \dfrac{e^x}{y}$ y(0) = 4

8) $xy\dfrac{dy}{dx} - \ln x = 0$ y(1) = 0

Verify whether or not the following are solutions to the given differential equations:

9) Differential	Potential Solution
$y'' + y = 0$	$y = C_1 \sin x - C_2 \cos x$
$y'' + 4y' = 2e^x$	$y = \dfrac{2}{5}(e^{-4x} + e^x)$

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10) Given $\dfrac{dy}{dx} = \dfrac{-4x+2}{y}$.

a) Write the equation for the line tangent to the graph at (2, -4) and use it to approximate f(1.8).

b) Find the particular solution y = f(x) to the differential equation with initial condition f(2) = -4.

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11) Population y grows according to the equation $\dfrac{dy}{dt} = ky$, where k is a constant and t is measured in years. Find the population in 2013 if the population was 12,000 in 1980 and the population doubles every 10 years.

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12) The rate of decomposition of radioactive radium is proportional to the amount present at any time. The half-life of radioactive radium is 1599 years. What percent of a present amount will remain after 25 years?