Calc Notes
Section 6.2 Name_____
Differential Equations: Growth and Decay

In sec 6.1, we learned how to solve differential equations in the form y'=f(x) or y"=f(x) meaning the y's were on one side and the x's were on the other side of the equation. Today we will learn how to solve a differential equation that has a 'mixture of variables' on each side. The strategy is called **"Separation of Variables" (which we will study again in 6.3)**

Solve the following differential equations.

$Ex\,1:\ Solve\ \frac{dy}{dx}=\frac{3x}{y}$

$Ex\,2:\ Solve\ y'=6+y$

$Ex\,3:\ Solve\ xy+y'=100x$

When a rate of change of a variable y is proportional to the value of y and y is a function of time t, the proportion can be written as: $\frac{dy}{dt}=ky$ However this form is not very "user" friendly because it is not solved for y. So solve for y:

Write and solve the differential equation that models the verbal statement. Evaluate the solution at the specified value of the independent variable.

Ex 4: The rate of change of y is proportional to y. When t = 0, y = 250 and when t = 1, y = 400. What is the value of y when t = 4 ?

Ex 5: Suppose that 10 grams of the plutonium isotope PU-239 was released in the Chernobyl nuclear accident. How long will it take for the 10 grams to decay to 1 gram? How much PU-239 will remain after 1000 years?

Ex 6: Suppose a population of lady bugs increases according to the law of exponential growth. There were 100 lady bugs after the second day of the experiment and 400 lady bugs after the 5^{th} day. Approximately how may lady bugs were in the original population?

Reminders: Compounded Continuously $A = Pe^{rt}$

Compounded (annually, monthly, (n)) $A = P\left(1+\frac{r}{n}\right)^{nt}$