

ODE for Physicists - Homework 4

Due: May 3, 2005

9. (6 pts.) Separable equations.
- (a) Solve the equation $(y + 2xy^2) + (x - x^2y)y' = 0$. (*Hint:* Substitute $w = xy$.)
 - (b) Solve the IVP $\cos y + ((1 + e^{-x}) \sin y) y' = 0$ with initial condition $y(0) = \pi/4$.
10. (5 pts.) First-order linear homogeneous equations.
- (a) Solve the IVP $y' + \cos(\omega x)y = 0$ with $y(0) = 1$, where $\omega \neq 0$ is a constant.
 - (b) Radium decomposes at a certain rate proportional to the amount present. It is known that half the original amount disappears in 1600 years. Find the percentage lost in 100 years.
11. (5 pts.) Use the method of variation of constants to find
- (a) the general solution to $y' + y \sin x = \cos x$,
 - (b) the solution to the IVP $y' + y \ln x = \frac{1}{x^2}$ with $y(1) = 1$.